THE
ELECTRICAL REVIEW

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How Much Development?

Interpretation of the Treasury Circulars

ABOUT three months ago (December 8th) we gave some guidance to those supply authorities who had doubts regarding the interpretation of the Treasury circulars restricting the raising of capital. Our remarks were made after consultation with the authorities concerned and they aimed at showing that the ban was not absolute, as some supply undertakings feared.

In spite of this there was still a great deal of hesitancy to proceed with any sort of development. Indeed, in some cases would-be consumers were denied a supply; this was flying in the face of the Electric Lighting (Clauses) Act, 1899, and rendered the reluctant authorities liable to penalties, unless, indeed, they could successfully maintain that they were prevented by *force majeure* (in the shape of the Treasury ban) from fulfilling their obligations.

The Electricity Commissioners have now considered it necessary to attempt to make the position clearer, although opinions may differ upon the success of the attempt. At all events, they state quite plainly that they have been assured by the Treasury that it was not the intention of the circulars to prohibit public utility undertakings from complying with their statutory obligations. Nor, the Treasury added, was it intended to prohibit them "from meeting, so far as practicable, the reasonable domestic and commercial demands of the community so long as the necessary mains, service materials and consumers' apparatus were readily available."

Limiting Factors

At the same time it was made clear that there could be no question of undertakers endeavouring, under war conditions, to proceed with the development of their undertakings to the same extent as in normal times. There must be unanimous agreement with the latter proviso, but the extent of the development which can be permitted is still undefined. The terms "so far as practicable" and "reasonable domestic and commercial demands" are capable of varying interpretations. The first is bound up with the supply of materials and apparatus. These must be "readily available" which may mean actually in stock or merely readily obtainable from suppliers. If they are not in stock their purchase means the expenditure of capital or surplus revenue, a matter in which the Commissioners have a say. This is a limiting factor, the extent of which is presumably to be defined by the Commissioners in any particular case. If extensions are necessary for war work or agricultural purposes there will be no question. But if the reason given is "pressing domestic and commercial needs" the Commissioners will be called upon to exercise their discretion.

Although from the foregoing it will be seen that the situation is still not crystal clear there seems to be hope that the terms of the Treasury circulars may be interpreted more liberally than the language used in them seems to permit. In them little distinction was made between the expenditure of capital and the use of surplus revenue for capital purposes. The memorandum addressed to local authority undertakings stresses the desirability of making use of revenue surpluses or other available funds in preference to borrowing. It seems to convey an implication that the expenditure of available funds will be regarded more favourably.

Effects of the "Truce"

This matter is very closely connected with the "truce" between the gas and electricity supply industries. A number of gas spokesmen have welcomed the abandonment of what they term "uneconomic competition," but we have seen few signs of happiness from the electrical side which naturally makes us suspicious of the probable results.

The question is not one which concerns the supply section of the industry alone. The cessation or a considerable reduction of development hits manufacturers and contractors harder than it does the supply undertakings, who can always make good their losses by raising their charges. The supply authorities may seek to soothe their consciences by believing that all manufacturers and contractors will find some sort of war work, but unfortunately a good many of them are not finding it so readily. In any event we cannot let them go out of business and expect them to start up again at the end of the war.

Therefore a certain measure of development must be proceeded with if we are to keep our industry together. We fully realise the urgent needs of the Services and export trade but we trust that when these needs are met there will still be a margin for what is, after all, a most important part of the social structure which we are aiming to preserve.

Engineers and the War

IT was only natural that the main theme of the speakers at the A.S.E.E. dinner should be the predominant part played by engineers in the defence of their country. From the record of reliability—superlatives seem deserved but, after all, it is only what England expects—of engine-room, boiler-house and auxiliary plant that has been put up by the Navy, it may be inferred that aircraft and the mechanised Army will meet equivalent tests of endurance that will also redound to the credit of British engineers. We shall probably have to wait awhile before much can be said about similar achievements in communications, especially radio, but when all the facts are divulged the country will find what an incalculable debt it owes to light-current engineering. As some mitigation of the evils of war, it may confidently be said that the technical advances made in this time of stress will later be turned to the proper end of engineering, "the service of mankind."

The B.A. in Wartime

LAST year's annual meeting of the British Association for the Advancement of Science at Edinburgh was interrupted by the war, and the latter half was cancelled. This year the meeting was to have been held at Newcastle, but circumstances will prevent this. Instead the Association is arranging a shorter Conference on Science in National and International Aspects which will be held at Reading from July 24th to 26th. It is of interest to recall that in 1914 the Association's annual meeting was held in Australia. In 1915 the position of labour after the war was given prominence at the Manchester meeting. Fuel economy was one of the principal matters discussed at the Newcastle meeting in 1916, when a committee which had been appointed to deal with the subject, under the chairmanship of Professor W. A. Bone, presented its first report, which also dealt with the utilisation of coal and smoke prevention. No meetings were held in 1917 and 1918, but they were resumed in 1919, when the Association met at Bournemouth with Sir Charles Parsons as President.

Tubular Heater Control

AT the lecture on the I.E.E. Wiring Regulations given by Mr. E. A. Reynolds to the A.S.E.E. last autumn, criticism was levelled against the requirement that non-luminous heaters in one room should be separately controlled. This criticism has been met in the revision of Regulation 701, included in the alterations to the eleventh edition which are summarised in this issue. Fixed tubular and panel heaters having untouchable elements and an aggregate rating of not more than 15-A, plus what is permissible for diversity, may now be controlled from a common switch, which in a residence must be in the same room. This concession should encourage an economical method without reducing safety.

Hydrogen Cooling

As two-pole machines can more easily be built to run at 3,000 than at 3,600 RPM, it was natural that alternators of 30,000-kW capacity should be running on the 50-cycle systems of Great Britain some years before those of similar outputs could be obtained for the 60-cycle standard of the United States. Now one 60,000-kW and several 50,000-kW sets of that speed are in service in that country. This advance is due chiefly to the use of hydrogen cooling, which is already used for thirty-three alternators in service, and which the American I.E.E. regards as one of the most important developments in the past six years. It permits a saving of up to 20 per cent. in effective material and a reduction in windage losses to one-tenth of those with air-cooling. In his "Review of Progress of Electrical Plant and Machinery" included in the *I.E.E. Journal* for February, Mr. G. A. Juhlin gives the improvement in full-load efficiency for a 50,000-kW, 3,600-RPM alternator as 0.9 per cent. While a saving of 0.6 per cent. for a 3,000-RPM machine does not make the use of hydrogen so advantageous under British conditions, the gain in fuel economy is nevertheless expected to be more than enough to offset the additional capital expenditure. As two 60,000-kW, 3,000-RPM generators of this kind are now under construction in this country, verification should be forthcoming before very long.

Export Assurances

THE vital necessity of maintaining and, if possible, increasing our export trade during the war has been stressed in these pages from the commencement of hostilities. It may seem superfluous to say so, but the achievement of this aim depends in the first place upon the receipt of orders from overseas buyers and only secondarily upon production. It is understandable that these buyers may wonder whether we are in a position to meet their requirements, and so there is a need for firm assurance that we are. This will be one of the principal purposes of our Special Export Number, timed to appear on March 15th, and it is pleasing to see that such an important concern as the General Electric Co., Ltd., is also playing a part in this fostering of confidence in the ability of the British electrical industry to fulfil export orders. Upon the outbreak of war this company put into operation a special export and distribution plan which included the despatch to buyers all over the world of a simple but convincing statement of the company's policy. It has thus not only increased its own prestige, but rendered a service to the whole of the British electrical industry.

Southend and E.D.A.

WE are sorry to see that Southend Town Council has decided that it cannot, at present, pay its full subscription to the British Electrical Development Association. Instead it proposes to make a "token" payment of £100 and reconsider the question in six months' time. No doubt the undertaking has been hard hit by the war, but the wisdom of the move is by no means certain. As Alderman Johnson, the chairman of the Electricity Committee, said, the undertaking has derived very considerable benefit from the Association's work and it may be that the continuance of that work would pull the finances round. We hope that when the matter comes up again it will be viewed in this light. Having admitted the value of E.D.A. by making a token payment, it does not seem fair to other undertakings that the Council should leave it at that.

Vehicles—and Batteries

Two articles in our issue of February 16th have drawn responses from the battery makers. The first point dealt with (by Mr. E. S. New in our Correspondence section) is the standardisation of vehicle batteries. Mr. New points out, with perfect truth, that accumulator makers *do* provide standard batteries which can be interchanged—a very necessary factor in the development of the "electric." The fault lies with the vehicle manufacturers, who (like so many other of the electrical industry's customers) have their own, often perverse, ideas on the subject. A battery maker takes up the second point—the disparity of weight-power ratios of petrol and electric vehicles rather luridly depicted by Mr. H. G. Wilson. He maintains that the comparison is grossly unfair to the battery vehicle, and points out that the same kind of battery is considered good enough in Germany to warrant the use of 27,000 "electrics" against our 5,000. The writer lays the blame for the relatively poor development here at the door of the vehicle manufacturers. We leave our readers to draw their conclusions after studying both sides of the case, but there seems to be scope for closer co-operation between the two parties in their common interest and for the benefit of the whole electrical industry.

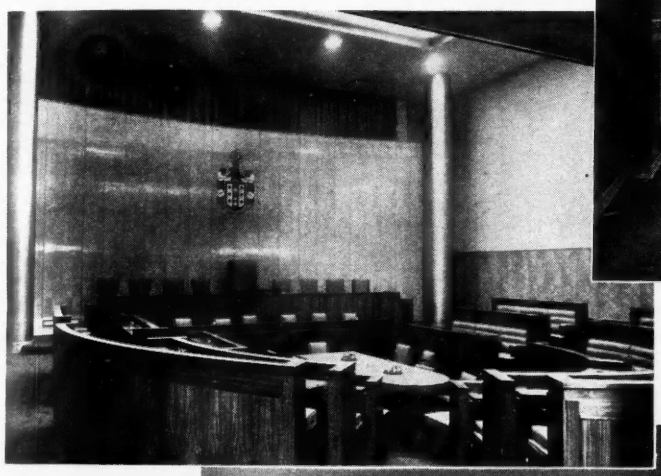
GREENWICH TOWN HALL

A Comprehensive Electrical Installation

LIKE most municipal buildings of similar importance erected during the past few years, Greenwich Town Hall provides not only for all the requirements of a modern civic centre necessary for the efficient conduct of the numerous departments of municipal business, with Council Chamber, Mayor's Parlour, committee rooms, offices, &c., but also caters for the social side of the borough by including two fully equipped theatres.

In a building encompassing all these facilities and costing nearly £250,000 it will be realised that the electrical installation work must have been very extensive. Moreover, in the two and a half years which elapsed between the preparation of the specification and the completion of the work, many electrical fashions have changed. This has produced a considerable increase in the original requirements, which in practically every case has been met by the original margin allowed in the copper and the general flexibility of the system.

The South Metropolitan Electric Supply Co.'s main transformers are installed in the basement. Next to the transformer room is the main switchroom where four oil circuit-breakers (Statter) with cubicle type switchboards of modern design (William White) control the supplies for power, heating, lighting and the services to the halls. A Matthews and Yates fan with a starter in this switchroom ventilates the transformer room.



The new Greenwich Town Hall is notable for the efficiency and attractiveness of its lighting. Here are the effects produced in the Committee Rooms (above), Council Chamber (left) and Minor Hall

Throughout the building special attention has been paid to securing both efficient and decorative lighting, and this is especially apparent in the civic section. Graceful bowl fittings of the flat dish type have been slightly recessed into the ceiling of the entrance hall, while a massive three-tier unit, made to the design of the consulting engineers, comprising large peach glass discs separated by 13-ft. length of "Mazda" tubular lamps, enhances the already impressive appearance of the staircase which, like the entrance hall, is faced with Travertine marble and has a hand-rail, &c., of manganese bronze.

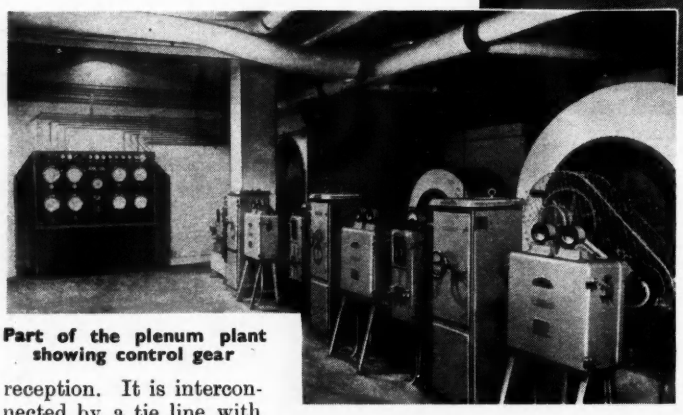
A striking feature of the Council Chamber, which is approached from the entrance hall by a short flight of stairs and an ante-room having laylights and four indirect wall brackets, is the use of concealed lighting for the main illumination. Strip-lamps in reflectors hidden from view in the square ceiling gallery provide a soft, well-diffused light which is supplemented by twelve square flush units in the side portions of the ceiling, fifteen "port hole" fittings round the walls of the public gallery, and four cylindrical units underneath the gallery. Desk lights are provided for the principal officers, and a gong system enables the Mayor to call members from the ante-room for divisions.

In the male members' room, in addition to a recessed ceiling pendant, there are four standard lamps with pleated vellum shades and further light comes from fittings placed at the back of the seats in an alcove. Louvred fittings give a concentrated light on the table in the committee room, which is also provided with wall brackets and indirect floor standards of bronze. Incidentally, the committee room, which is 90 ft. long, can, if desired, be divided into three sections by two electrically operated partitions. These partitions, which are panelled on each side to match the decorations and weigh 2 tons each, are operated on much the same principle as motor-car jacks by means of a compressor (with a 7-HP, 950-RPM J. Stamford Electrical motor) working at 400 lb. per sq. in. and driving light oil through a pipe system. Alternative controls enable operation to be effected either from the committee room or from the basement, where the compressor is housed.

Star-like fittings inset in a blue ceiling have been

employed very effectively for the main entrance hall serving the two assembly halls. For the auditorium of the Borough Hall, which seats about 800, the lighting is by means of louvred inset ceiling units and port-hole wall units, while in the Minor Hall decorative wall fittings with golden coloured louvres are utilised. Actually, in both halls and in all corridors, three systems of lighting have been provided—primary, primary main-wired (permanently illuminated) and secondary lighting obtained from a " Keepalite " floating battery system.

A complete stage lighting system is installed for each hall, with Strand dimmers and Major curtain controls. An E.M.I. public address system situated in the wings of the Borough Hall comprises a 24-W amplifier, twin gramophone turntables, microphone inputs and facilities for broadcast reception. It is interconnected by a tie line with a smaller board in the Minor Hall, where further microphone inputs and turntables are installed. The Borough Hall amplifier is also wired to the committee room for a microphone and two loudspeakers.



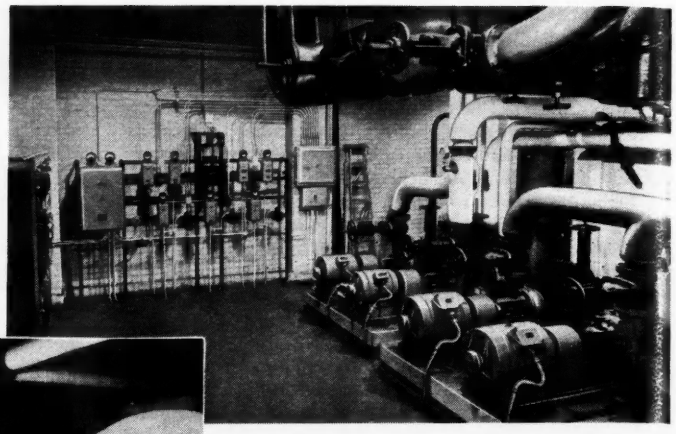
Part of the plenum plant showing control gear

For heating the building four " Metropolitan " coal-fired boilers equipped with Prior automatic stokers, ash hoist (London Lift Co.) and Radiovisor smoke indicators, are used. Drayton water switches control the temperature of the boilers. A plenum air conditioning system serves the two halls, the Council Chamber and portions of the office section, and twelve Bull " Super Silent " motors of capacities ranging from 1 to 14 HP, 730/460 RPM serve to drive the intake and extract fans and the circulating water pumps, Brookhirst control gear being provided. The hot water for the plenum system is taken from the boiler at 160/180 deg. F., " Arca " thermostats being fitted to both preheater and main heater. " Ventex " filters remove impurities from the air. A check on the operation is kept by means of a Negretti & Zambra instrument panel which includes an 18-point distance temperature recorder. Concealed heating is employed throughout in the form of panels embedded in the ceilings.

The water required for the panel heating system is circulated by an F. A. Pullen pump (3-HP 920-RPM Bull motor), also arranged in duplicate. The return water is either returned to the boiler or to the system according to the requirements of the flow temperature, the control being obtained by a magnetic mixing valve (Magnetic Valve Co.) operated thermostatically. The water temperature in the panel systems varies from 90 to 120 deg. F. according to weather conditions.

The mixing valves, or modulator, are operated by means of relays and work off DC at 170 V supplied by a small Westinghouse rectifier. Although thermostats are installed at all the necessary points, an additional safeguard against overheating is provided in the outgoing water supply to the panels by a Drayton regulator which, upon the temperature rising above a predetermined level operates a valve, stops the pump and rings an alarm.

For use at night when no stoker is on duty and when the full temperature is not required, there is a special kindling control which gives the boilers ten minutes' blowing every hour. A small pump ($\frac{3}{4}$-HP motor) caters for the hot water service. Instruments on the control panel (Negretti & Zambra) include an Everett Edgcumbe operating grapher for the smoke recorder;

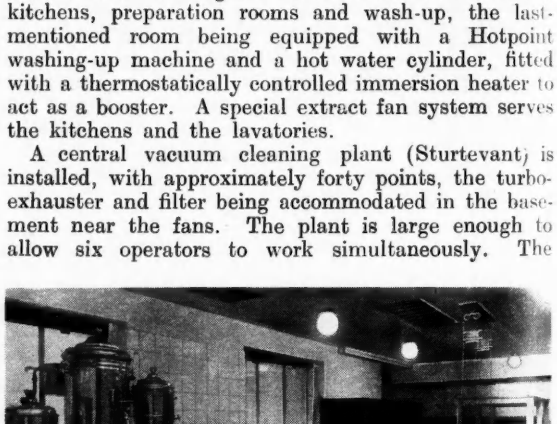


Circulating pumps and control gear for the hot water for the plenum and radiator systems

a 12-point distance temperature recorder; plenum and panel flow and return temperature indicators.

All the cooking for the public and staff refreshment rooms is carried out electrically, the equipment including Benham cookers, hot cupboards, and grills; Jackson double cooker, steamer for potatoes, and hot cupboard; Jackson and Stott boilers for tea, coffee and hot milk; and five Kelvinator and Frigidaire refrigerators. A Waygood-Otis food lift serving six floors connects the various kitchens, preparation rooms and wash-up, the last-mentioned room being equipped with a Hotpoint washing-up machine and a hot water cylinder, fitted with a thermostatically controlled immersion heater to act as a booster. A special extract fan system serves the kitchens and the lavatories.

A central vacuum cleaning plant (Sturtevant) is installed, with approximately forty points, the turbo-exhauster and filter being accommodated in the basement near the fans. The plant is large enough to allow six operators to work simultaneously. The



A corner of one of the all-electric kitchens

exhauster is driven by a 12-HP Bull motor running at 960 RPM. Other electrical features of the building include three 10-cwt. lifts (Waygood-Otis) having a speed of 200-ft. a minute; an impulse clock system (Magneta Time Co.); and automatic telephones (General Signal and Time Systems).

The architects were F. Culpin & Son, the electrical installation work being carried out by Electrical Installations, to the specification of Mr. D. Winton Thorpe, consulting engineer, in association with Mr. Waldo Maitland as lighting consultant. G. N. Haden & Sons undertook the heating and ventilation installation, J. Roger Preston & Partners acting as heating

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MOTOR SERVICING

Practical Advice for Dealing with Single-phase Repulsion-Induction Types

By James E. Noble

SINGLE-phase repulsion-induction motors have for many years been very popular where arduous starting conditions have to be catered for. The most usual applications are in refrigerator work, and the smaller sizes are extensively used for domestic cabinets, butchers' cold-rooms, and ice-cream plant. While, to an expert, their servicing presents no difficulty, they are often somewhat of a stumbling-block to the average local contractor's staff. Much trouble and expense could be saved if the following facts were more generally known.

It must be clearly understood that a repulsion-induction motor is a combination of two types. It starts up as a repulsion motor, with the advantages of high starting torque and moderate starting current, known as the series characteristic. In other words, it behaves at first as a series motor, but on attaining approximately 75 per cent. synchronous speed it is made to assume the characteristics of a simple induction motor, by the employment of a centrifugally operated device which short-circuits all commutator segments, thus converting the wound armature into a cage rotor.

In the majority of designs the brushes are also lifted from the commutator, consequently minimising brush wear and noise. This entails extra wearing parts, however, which add to the service-man's burden. The commutator short-circuiting device takes a variety of forms, according to the respective designers' fancy. It can be made to operate radially or longitudinally, and the contacts are usually a bracelet of small copper segments or a serrated disc.

Stator Winding Faults

The stator usually has a simple concentric winding with interconnections easy of access. Three faults only can occur: open circuit, short circuit and "earth." In the first case the fault will usually be obvious, as the motor will make no attempt to start, nor will there be any hum to indicate that current is flowing. The suspicion of this fault can be confirmed by testing with a lamp at the motor terminals, and testing for continuity of the stator winding with a lamp or buzzer, whichever is more convenient. This applies only if all coils are in series. If, as is sometimes the case, the winding is split for 110 or 220 V and the parallel connection is being used at the lower voltage, the symptoms of one half open circuit will be general loss of power. This can be confirmed by disconnecting the motor leads and testing each half for continuity.

Stator open circuits are rare, and when they do occur are usually traced to a dry or badly soldered joint between coils. An actual break in a coil is almost unheard of, although the author has experienced cases in which one coil had gone down to earth in a slot and blown itself clear, at the same time burning through the wire, without showing external signs. Tests for continuity should not be made with a "Megger," as the results are apt to be misleading: the 500 V or so generated may break down a high-resistance joint and show perfect continuity.

A stator short-circuit is rare, too, and is almost invariably due to bad workmanship in winding, although it may not show itself until some time after manufacture. The symptoms are excessive noise and loss of starting torque, to a varying degree depending on the magnitude of the fault. This is accompanied by excessive heating of the whole motor, and the shorted turns in particular, which will get hot very quickly and may burn out, even on no-load. An ammeter in series will indicate a very appreciable rise in current on all loads, thus the location of this fault is usually a fairly simple matter, but a cure is only effected by rewinding the faulty section or coil.

Provided that the motor frame is earthed, an earth on the stator winding will show the same symptoms as a short-circuit, to a degree depending on the position of the fault with respect to the two ends of the winding. Usually the first indication of an earth fault is a blown fuse, and a "Megger" is the recognised instrument for locating an earth, but if the earth is of sufficient magnitude to blow a fuse, a test lamp used at mains voltage is quite effective.

If after isolation of the fault the rest of the winding shows a reasonable test on a "Megger," and appears to be in good order, it will usually only be necessary to rewind the faulty section or coil; but if the general test is low, and the breakdown has been caused by damp, it may be sound policy to rewind the whole stator. Actual experience is the deciding factor in this case.

Rotor Winding Failures

It must always be remembered that the rotor is not connected to the mains. The currents in it are induced, and are at a low voltage. As in the stator, the three faults are open circuit, short-circuit and earth, but the symptoms differ. An actual break in a rotor wire is rare, but can occur close to the commutator bars due to crystallisation caused by vibration of a loose commutator or loose rotor laminations. By far the most usual form of open circuit in a rotor is caused by overload. The heat generated melts the solder at the point where the coil leads are joined to the commutator, thus causing bad connections.

The symptoms of rotor open circuit are severe loss of starting torque, with very bad sparking at the brushes and burning of the segments adjacent to the open circuit. The latter effect is of itself a reliable indication. If there is more than one open circuit, the motor will probably refuse to start at all, but may do so on no-load if the rotor is turned by hand to a more favourable position. A bar to bar voltage-drop test will localise the fault or faults.

A short-circuit in the rotor winding will not be apparent when the motor is running at full speed, and it will have no effect on performance, as all coils are then short-circuited at the commutator. The starting torque will be very much impaired, however, varying up to 100 per cent., depending on the magnitude of the fault. The speediest way to test for short-circuit is to lift or remove all brushes from the surface of the commutator, and switch the stator on to the full voltage. If the winding is free from shorts the current taken will be approximately half the no-load current, and it will be possible to turn the rotor freely by hand. Even if only one turn is shorted, however, the rotor will tend to rock into certain definite positions of minimum torque. If the rotor is forcibly held in the position of maximum torque, the shorted turn or turns will quickly get hot, thus indicating their position.

Alternative Test

An alternative shorted-rotor test for fractional-HP motors is to lift all brushes as before and connect the stator in series with, say, a 100-W lamp and the mains. As the current passing is small it will be possible to turn the rotor freely, but the light from the lamp will rise and fall as the shorted turns pass through maximum and minimum positions. Unfortunately, little can be done with a short-circuited rotor winding except rewind, but it is always worth while to make a close inspection of the commutator, on the off-chance that excess solder or carbon deposit between the segments may be the cause of the trouble.

The brushgear and commutator short-circuiting device are rarely insulated from the frame. Hence an earth on the rotor winding will show the same symptoms as a short-circuit, but will not be apparent when the brushes are lifted. Therefore it is good practice to make an insulation test as a matter of routine. A low-voltage test will suffice, but a "Megger"

Greenwich Town Hall (*Concluded from previous page*)

and ventilation consulting engineers. Henley cables were used for the five rising mains, and a large quantity of J. & P. v.i.r. cable, with G.E.C. "Silverlac" conduit, was required. All local switches were made by J. H. Tucker & Co., the manufacturers responsible for the lighting fittings being Troughton & Young, G. Harvey & Co., New Light Fittings, Tucker & Edgar, Allom Bros., Benjamin Electric, Simplex Electric Co., Best & Lloyd, Charles Selz, and K.F.M. Signs.

We should like to thank Mr. F. W. Tunnadine, Mr. Winton Thorpe's colleague, and Mr. O. Brogan, the chief engineer at the Town Hall, for their assistance in the compilation of this article.

should not be used, as the presence of carbon deposit may give a fictitious reading.

There is one outstanding fault which is often puzzling. The motor may start up normally and reach the speed at which the brush-lifting device comes into operation. The brushes will apparently be in good order and not sufficiently worn to be discarded, but in reality the wear may be such that there is a gap in the sequence of events. In other words, the brushes lift off the commutator before the short-circuiting device operates. Actually there should be a slight overlapping of the two actions. If on load, the motor will continue to run at approximately 75 per cent. of its full speed with much sparking and "fireworks" at the brushes. If on no-load, the gain in momentum caused by acceleration will probably carry the sequence on and the short-circuiting device will operate, the motor running up to full speed normally.

All this usually leads an inexperienced man to believe that the motor is being overloaded. If the commutator short-circuiting contacts are pitted and dirty they will obviously make bad contact. The power of the motor will not be greatly reduced if one or two segments only are not properly shorted, but an electrically unbalanced rotor will result, giving rise to excessive vibration and noise.

The brush position relative to the stator coils is very important and critical if the highest starting torque is required. The position for each direction of rotation is usually marked, but can be found experimentally as follows. For each pole of the stator there is a position of maximum short-circuit current, which is also the dead centre between one direction of rotation and the other. This position, which is fairly critical, should be found first. Now imagine the distance between one pole and the next to be divided into 180 degrees, and then move the brushgear 17 degrees on either side of the dead-centre position, the movement to be in the direction of rotation required. This will give the best average position.

It should be pointed out that there will also be a neutral position at 90 degrees. This is not very critical, and the torque remains very small for some distance on either side. Also movement of the brushgear away from this neutral point gives increase of torque in the opposite direction.

Even soundly constructed brush-lifting and short-circuiting devices, after being in service for some years, however, are apt to wear. This, together with an accumulation of dirt, may cause the mechanism to fail to operate on starting, or return to normal on stopping. In the former case the motor will run on the brushes indefinitely, and the speed will vary with the load. In the latter case the motor will refuse to start next time and, as the current taken under these conditions will be very heavy, will be in danger of being burnt out.

The best form of protection for this class of motor is undoubtedly a carefully-set thermal overload switch. Its cost is somewhat greater than that of ordinary fuses, which are on the whole unsatisfactory for sole protection, but are a useful auxiliary. They can be made to give reasonable protection, but when they blow are apt to be replaced with a heavier gauge of wire, so destroying any protection they may otherwise afford A thermal overload switch can be re-set with a push-button, leaving the same degree of protection for the next run. It is also not so critical in adjustment, as the greater thermal delay allows for the surge starting.

Development in Wartime

Electricity Commissioners' Memorandum

DURING the latter part of last year the Treasury sent circulars to public authorities and public utility companies concerning the raising of money for capital purposes and the necessity for conserving the capital resources of the country primarily for such purposes as were essential to the successful prosecution of the war; and intimating that the consent of the Treasury to the exercise of borrowing powers would not be given unless the project was of pressing necessity either for reasons of public need or on account of war requirements.

In letters which they have sent to public authority undertakers and electricity supply companies the Electricity Commissioners state that from the representations which they have received it appears that in a number of cases the circulars have been construed by electricity undertakers as imposing, in effect, an embargo upon the provision of supplies of electricity to any new consumers except where the supplies are directly required for war work.

In individual cases where their views have been sought, the Commissioners have pointed out that undertakers are not precluded by the circulars from considering the public need arising from domestic and commercial demands; and have suggested that the kind of works which might justifiably be undertaken for meeting such demands would include those required for affording supplies of electricity to premises on the route of existing mains, to premises in process of completion for occupation and needing a supply for lighting, cooking or power, for meeting the needs of evacuees, and for assisting or augmenting agricultural or horticultural production.

Statutory Obligations

The Treasury, with whom the Commissioners have been in communication on the matter, have confirmed that it was not the intention of the circulars to prohibit public utility undertakers from complying with any statutory obligations, or from meeting so far as practicable the reasonable domestic and commercial demands of the community so long as the necessary mains, service materials and consumers' apparatus are readily available. On the other hand, there can be no question of undertakers endeavouring under war conditions to proceed with the development of their undertakings to the same extent as under normal conditions, or to provide as complete facilities as formerly to consumers in the way of assisted wiring and the hire or hire-purchase of apparatus.

Undertakers must continue to draw a distinction between works and facilities which are for meeting necessary domestic and commercial requirements and those which although desirable could be postponed without undue hardship. Care should also be taken by the undertakers to avoid any undue depletion of their spare stocks of cable, transformers, &c., held in reserve as an air-raid precautionary measure in view of the possible difficulties which may be expected in replenishing such stocks.

Any additions to or modifications of distribution systems should be confined to those necessary to meet demands for supplies for war purposes, or for pressing domestic and commercial needs that can be satisfied without prejudice to supplies for war purposes, and to maintain supply voltages within the prescribed limits; and any work on change-over from direct to alternating current should be limited to the minimum necessary for avoiding expenditure on extensions of converting plant and direct current mains.

As an alternative to borrowing, undertakers should consider making the fullest possible use of any surplus revenue or other available funds for defraying expenditure on meters, consumers' apparatus and any change-over or alteration thereof required for meeting the public needs. In conclusion, the Commissioners emphasise that in any case where their consent to borrowing or to the use of surplus revenue or other available funds is necessary, no commitments should be entered into by the undertakers until the necessary consent has been obtained.

It should be noted that the last paragraph appears only in the letter addressed to public authority undertakers.

Hungarian Power Scheme

DETAILS of a scheme for providing an additional supply of power to Budapest and the surrounding districts have been made known in the Hungarian capital. A new central station will be built in the Matra mountains about 60 miles from Budapest at an estimated cost of about £2,500,000. The capacity of the new station is to be 90,000 kW, thus increasing the present supply of power in the capital by 50 per cent. and making its share in supplying the total requirements of the country 40 per cent.

On the basis of the present increase in demand it is expected that existing sources of supply will prove inadequate by 1942 and therefore it is suggested that the construction of the new power station should be started without delay. A site in the Matra coalmining district is proposed in order to save the cost of transporting fuel to the capital, and it is planned to use low-grade coal. The City Council has acquired mining rights over a certain area and will, in addition, enter into contracts with private owners. The estimated cost of £2,500,000 mentioned above includes a sum of £200,000 for coalmining operations. The capital will be raised between now and 1943 by an internal loan in four yearly instalments and is said to have been already underwritten.

SEEING AT NIGHT

Aspect of Particular Importance During the Black-out

By R. G. Hopkinson, B.Sc.(Eng.), F.R.P.S.

THE response of the eye under the feeble illumination of black-out conditions is very different from its response in normal times. The eye functions like a camera in that light is gathered by the lens of the eye and is brought to a focus upon the retina, which acts rather as a photographic plate in recording the scene for the brain to interpret. The lens of the eye is provided with a diaphragm (the iris) which automatically opens and closes to admit the requisite amount

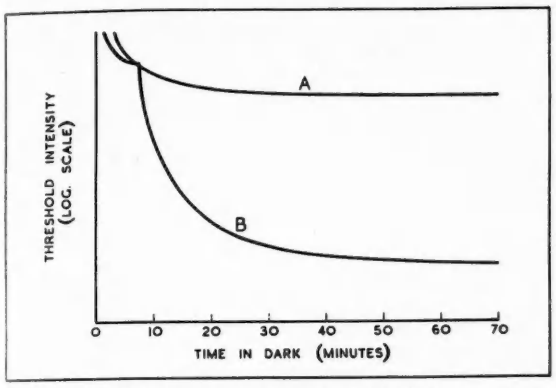


Fig. 1.—Dark-adaption curves for (A) night-blind person, and (B) normal observer (after Dieter)

of light to the retina, in the same way as the " stop " of the camera lens is adjusted according to the light. Unfortunately, the lens of the eye produces a poorer defined image when the iris is fully open, as under black-out conditions, and for this reason alone the visual image will then be less distinct.

The retina acts rather as a double-coated photographic film; such " chrome " films are specially coated with a fast emulsion to record the bright areas of the scene, and a slow emulsion to record the shadows. Similarly, the retina of the eye is provided with two separate kinds of receptor nerve cells which are distributed all over its surface. One, called the "cones," responds to bright scenes, and the other, called the "rods," to dark scenes. In daylight only the cones function. With bright artificial light both rods and cones are working, the rods recording the shadows and the cones recording the highlights for the brain. Under black-out conditions only the rods work.

Black-out vision is much inferior to day vision for the following reasons.—(1) The rods do not record colours, hence black-out vision is devoid of colour sensation. All colours appear as varying shades of black and grey. (2) There are fewer rods per unit area of the retina than there are cones. The effect is analogous to that of a newspaper reproduction of a photograph, which is made up of a number of dots and is therefore less clear than the original. This handicap is the more serious since it is in just that region of the retina which normally receives the clearest image (i.e., the *fovea centralis*) that the rods are fewest. Hence, at very low illuminations vision is often better round the periphery of the eye.

Adaptation of the Eye

The eye adapts itself to the conditions in which it finds itself, both by the automatic adjustment by the iris of the pupiliary aperture and also by photo-chemical changes which occur in the retina itself (as if it were possible to adjust the sensitivity of the photographic film in the camera). Pupiliary adaptation accounts for a range of only five to one, the retinal adaptation for a range of probably ten billion to one.

The time taken to adapt to very low illuminations is different for different people. Normally, dark adaptation is not complete for thirty minutes after leaving a brightly lighted room, but it is practically complete after about fifteen to twenty minutes. Dark adaptation takes place in two stages, the first being complete after about ten minutes, when, it is believed, the rods begin to function. There is then a rapid acceleration of the dark adaptation process, which is well advanced after a further five minutes.[1]. Dark adaptation is, therefore, a slow process, and a person of normal vision should not, for example, leave a brightly lighted room and immediately drive or cycle away into the black-out.

Some people do not dark-adapt in two stages, but adapt as far as they are able in ten minutes, which corresponds in normal persons to the first stage. Such people are usually " night-blind," and are unable to achieve any useful vision under black-out conditions. Night-blindness is often coupled with vitamin-A deficiency, perhaps due to malnutrition. Others are believed to adapt very quickly, but they are a minority.

Perception of Brightness

Although the lens of the eye records a faithful impression of a scene on the retina, the picture conveyed to the mind is not necessarily complete. Thus the lens of a camera conveys an accurate impression of a scene to the photographic film, but if the film is of poor quality an inaccurate photograph results.

A knowledge of the nature of the picture which the mind receives cannot be obtained by direct measurement, because it requires a knowledge of the sensations produced by different brightness stimuli. Data available, however, indicate that: (*a*) Over a restricted range at high brightness levels, equal *ratios* of brightness produce equal apparent changes of brightness. (Weber-Fechner Law.) (*b*) At low levels of brightness, the Weber-Fechner Law does not hold.

The relationship between the brightness stimulus (as measured by a photometer) received by the retina and the apparent brightness sensation received by the mind may be taken to correspond to the characteristic H and D curves of photographic emulsions, which give the relationship between the brightness stimulus projected on to the plate by the lens of the camera and the density of the resultant image.

Fig. 2 shows such a curve corresponding to the conditions of black-out vision. It is evident that in this case equal ratios of brightness stimulus present quite different contrasts (i.e., differences in apparent brightness) in the mind of the observer. Thus a ratio of 10 :1 as represented by the stimuli 0.1 e.f.c. and 0.01 e.f.c. shows a contrast represented by A and B on the apparent brightness scale, of the sensation internal curve represented, but a ratio of 10 :1 as represented by the stimuli 0.0001 e.f.c. and 0.00001 e.f.c. indicates the much smaller contrast represented by A^1 and B^1. As most of the objects to which the curve applies will have brightnesses

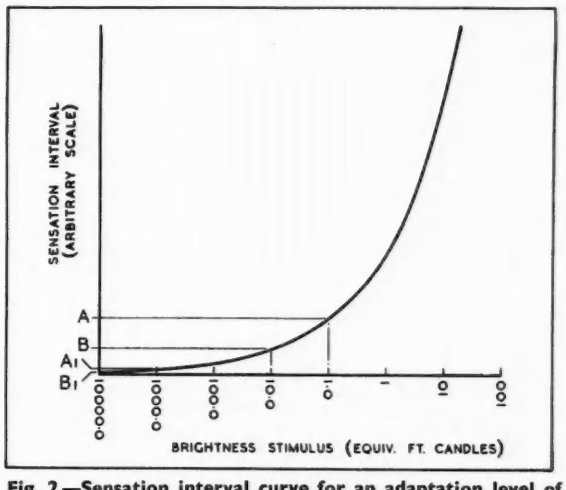


Fig. 2.—Sensation interval curve for an adaptation level of 0.0004 equivalent ft.-candles (after Abribat)

of the order of 0.001 e.f.c. or less (since the curve is drawn for an average brightness of 0.0004 e.f.c.) the differences in the apparent brightnesses of such objects will be very small and hence they will be seen only with difficulty.

The photographic analogy of this is that of a camera loaded with a slow film. The maximum exposure of which the camera is capable (limited by the widest aperture of the lens and the

(*Concluded at foot of next page.*)

[1] Hecht. Physiol. Rev., Vol. 17 (1937).

THE RESIDUE LOAD

An Analysis of the First War Quarter

By G. O. McLean, M.Eng.

HAVING got through the first quarter-year of war conditions the supply engineer can reasonably assume the settling down period to have arrived, and begin to take stock so that he will know what he has to face in 1940. Most undertakings have wisely refrained from making any tariff alterations until such an accounting time as the year end presented itself.

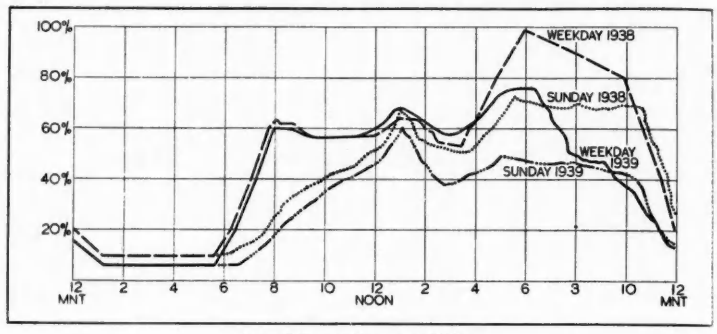
An analysis of load curves, and particularly what may be called the "residue load," may be useful in arriving at tariff-change decisions. As an example, the accompanying diagram shows typical load curves for late November last year and in 1938 (plotted with the November, 1938, m.d. as 100 per cent.) of a London suburban borough. The most obvious points are the loss of night load due to street lighting and of the evening peak. The evening peak has been reduced by 26 per cent., but the load at 8 p.m. and 10 p.m. is almost 40 per cent. down, the time for the fall of load having advanced from 7 p.m. to soon after 6 p.m.

From the Sunday curves (assumed to be almost entirely domestic load), it will be noticed that the evening load is down by 20 per cent., though this is $20 \times 100/70 = 28$ per cent. of the 1938 Sunday load. Since the difference between the total reduction (26 per cent.) and the domestic reduction (20 per ceut.) is only 6 per cent., of which 4 per cent. can be accounted for by street lighting, it would appear that shopkeepers and businesses are following the advice of E.D.A. and E.L.M.A. by "Blacking-in and not out," and their only sacrifice has been shop window lighting. The earlier closing hours will account for the big difference at 8 p.m. and 10 p.m. and these constitute a serious loss of revenue.

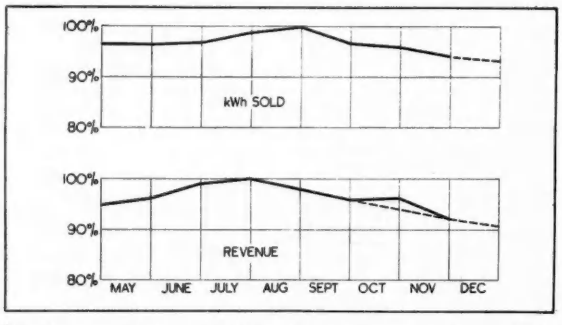
The bright feature about the load curve diagram is the improvement in load factor, as the lopping off of the peak means a proportionate increase of load factor if the rest of the curve is substantially the same, as it actually is. The effect this has on the cost of energy item on the debit side of the balance sheet is enormous, because the fixed charge part of a two-part tariff is, for normal rates, higher than the running charge part. For example, a tariff of £4 per kW plus 0.25d. per kWh means an average kWh charge of 0.3653+0.25d. at 30 per cent. load factor. With a 20 per cent. improvement bringing the load factor to 36 per cent. the kWh charge becomes 0.3044+0.25d., which is approximately 10 per cent. lower. Unfortunately, many undertakings had high maximum demands in January, 1939, so that the *annual* load factor is dependent on those figures and not on the demands towards the end of the year. It is 1940, however, that has to be legislated for, and if the war lasts *throughout* the year the loss of lighting load is likely to create a beneficial increase of 15 to 20 per cent. in the load factor in the case instanced.

The cost of energy is only one item (say, 25 to 30 per cent. of the total) on the expenditure side, and most of the other items, such as distribution and management, are more or less fixed, or at least difficult to reduce with reduction of output—and these items must be given their full weight in financial considerations. Against this, most of these fixed charges should be covered if the majority of consumers are charged on two-part tariffs, if the latter have been based on costs and if the reduction has been due to restricted consumption and not loss of consumers.

The losses can be seen from the second diagram, which shows moving annual totals of kWh sold and revenue. The reduction in output of 6 per cent. in three months appears serious, but since the loss is mainly due to lighting, the percentage will decrease as winter changes to summer, and the trough of the curve is not likely to fall below the 80 per cent. or even the 85 per cent. mark. The revenue curve trend is, therefore, not so serious as it looks, though the advance gained in six months is lost in half the time. Here again the drop is likely to be arrested fairly soon, and the trough will probably be about the 85 per cent. mark. The failure of the curve to follow faithfully the one above it is due to the vagaries of collection, the hump in October being caused by an effort to clear all slot meters and follow up debtors.



Late-November conditions



Moving annual totals. (Since the curves were prepared the December results have confirmed the estimates)

In my opinion it would do more harm than good to attempt to recover the lost revenue from the reduced output, though there may have to be adjustments of tariffs where these have already been subsidised by other consumers, and where the margin has been slight increased costs such as coal may have to be passed on as a general percentage increase. An increase of revenue could be obtained by attempting to meet the continued public demand for electric cooking and water heating, and it would appear to be of national importance that reasonable hire and hire-purchase schemes should be revived and that the Commissioners should grant financial sanctions to facilitate such a course.

With regard to possible increases in individual consumers' consumptions, any control scheme should take account of the *total energy* consumption, and not attempt to maintain existing proportions between the different forms of energy.

Seeing at Night (*Concluded from previous page*)

slowest speed of the shutter) is given in order to record the scene, but as the film is so slow, only a feeble image is recorded, and hence the photograph is lacking in detail and poor in contrast.

Under black-out conditions, a light that would normally appear insignificant can become a glare source, because the eye is working at its maximum sensitivity. A glare source can produce two effects. The first is on the visibility of objects[2]. Objects which can be seen clearly in the absence of the glare source are rendered less visible in its presence. The other effect[3], no less important, is on the comfort of the observer, quite apart from alteration of the visibility of objects. The disabling and the discomforting effects of glare are probably separate phenomena, because they appear to obey different laws.

Seeing is so precarious under black-out conditions that the slightest degree of disability glare may reduce the already poor visibility to nil. Discomfort glare, though possibly not so immediately serious, may nevertheless give rise to accidents simply through the increase in nervous strain caused by the distraction of the glare sources.

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[2] Luckiesh & Holladay. Trans. I.E.S. (Amer.), Vol. 20, p. 221. Stiles. Proc. Roy. Soc. Vol. 104 (B), p. 322.

[3] Hopkinson. Trans. Illum. Eng. Soc. (Lond.). Vol. 5 (in publication).

TRANSATLANTIC AIRPORT

Extensive New Terminus at North Beach, N.Y.

NORTH BEACH AIRPORT, completed a few weeks ago, occupies 558 acres on the East River and is about 25 minutes' drive from the centre of New York City. It was built by the Federal Government's "Work Projects Administration," which contributed labour to the extent of 70 per cent. of the cost, the City of New York furnishing the 30 per cent.

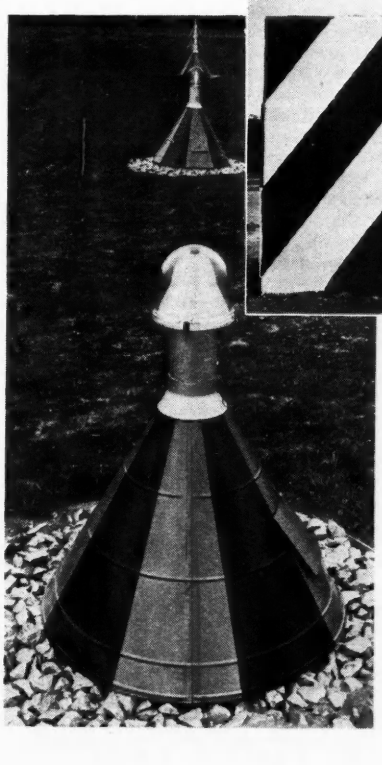
View showing about half of the new airport, with the main administrative building and control tower in the foreground

for materials. Total investment is in excess of £8,000,000. Occupying its seven hangars are the Pan American Airways, American Airlines, TWA, and United Airlines. Eastern Airlines and Canadian-Colonial Air Lines are expected to occupy two more hangars to be built.

Power is supplied from the local undertaking by means of four 27-kV feeders and four sub-stations. There are about 160 miles of duct serving the field. Voltage is stepped down at three transformer vaults in the airport to 120-208 V for local service. For lighting the field the supply is stepped up to 5,000 V and taken to the flood and runway contact lights for which the voltage is again stepped down. In addition to the main telephone installations there is a private six-exchange dial system, each exchange handling 100 connections.

On top of the 64-ft. control tower is a rotating double-end beacon furnishing 13,500,000 c.p. In each hangar are fifty-five lighting fittings, with lamps of an aggregate of 32 kW, suspended from trusses of the 62-ft. ceilings. About half of the fittings contain 750-W incandescent lamps and the remainder 400-W mercury-vapour lamps.

Field illumination includes contact lights at 200 ft. spacing along borders of the runways (which range in length from 3,500 to 6,000 ft.), the fixtures projecting 2 in. above ground. Each throws one beam horizontally and one beam 15 deg. from the horizontal over the runway. Brilliancy in these ranges, depending upon atmospheric conditions, is controlled from the central tower. Lights are equipped with colour filters for amber, also controllable from the tower, so that an amber stretch is followed by white in guiding a pilot in landing from any direction.



Green range lights at the ends of the runways which show when the pilot will run off the macadam and concrete surfacing

Buildings are marked with red neon obstruction lights with automatic switch-over to an alternative lamp when one is defective, which is indicated to the control tower operator. At the end of each runway are green range lights and two narrow-beam floodlights, each of 7,500,000 c.p. Runways are connected by taxi-lanes with the 400-ft.-wide apron, which borders the hangars and the 1,200-ft. loading and unloading platform. Red traffic light indicate when a runway and taxi-lane are in use. As a plane crosses the taxi-lane to or from the runway to the apron the wheels actuate a treadle which delivers a signal to the control tower.

The field is outlined by eighty-five amber and prismatic boundary lights, 250 ft. apart, alternately connected on two circuits. The 400-ft. apron is illuminated by five floodlights mounted on each of the six hangars which flank the control tower building and loading platform. The control tower is air-conditioned and has windows on all sides. When a plane lands at night, floodlights and runway contact lights go out and the taxi-lane illumination shows the pilot the route to the apron and loading and unloading platform.

One of the two-light fittings installed at the end of each runway. The large lens is a floodlight and the other a signal light with red and green filters. On top are two small obstruction lights

The seaplane landing, hangar and administration building on Bowery Bay is illuminated by two banks of floodlights so situated that the pilot, whether taxi-ing in or out, will not receive a glare. Each bank comprises three 3,000-W floodlights. All lighting at the seaplane base is controlled from its own administrative building, but may be operated from the main terminal building. The transmitter for radio-controlled landing is at Long Island, nearly four miles away. When the pilot is on the beam he receives a continuous signal; to the left of the beam he hears the code letter N, and to the right the letter A. Over the transmitting station, the pilot picks up a high-frequency note and at half-distance to the landing field he receives a second, giving his exact distance to the runway.

All radio receivers for the airport are about 1¼ miles across the river channel from the field in order to eliminate local electrical interference from motors and machinery. Fifteen radio receivers are tuned to frequencies of different air-lines and private planes. Connecting this installation with the airport is a 230-pair cable, providing three pairs to

(*Concluded on next page*)

INSTITUTION PROCEEDINGS

Modern Blast Furnace Practice in America. Frequency Regulation and Load Sharing. Electrostatic Shielding for Transformers. Progress in Boiler Design

Pig-iron Production in America

NUMEROUS illustrations and tabulated data accompany a paper on the manufacture of pig iron in America by Mr. W. A. Haven (Cleveland, Ohio) which is to be included in the May meeting programme of the Iron & Steel Institute in London.

The author describes the practice adopted in nearly all modern American blast furnaces, notwithstanding considerable differences in the nature of the raw materials used (which are also reviewed) as well as means of transport. Storage is generally in large rectangular yards all parts of which can be reached by travelling-bridge type cranes. The quantities handled amount to as much as 2,500 tons per day for a single furnace. Equipment for charging such tonnages of ore, along with the required coke, limestone and other raw materials, with a single man per turn, is one of the outstanding accomplishments of American blast-furnace design.

Coke is drawn from bins located centrally, above the skip, by motor-operated feeders, which also function as screens, into weigh-hoppers. Drawing and weighing the coke, dumping the weigh-hoppers through drop doors into the skips, and the complete charging, hoisting and top charging operations are automatically performed in prearranged sequence by motor-driven apparatus under the control of interlocked electrical devices. After a charge or skip of ore is hoisted, the master control switch of the automatic charging system is thrown by the scale-car operator, who can then depart on a trip for another charge of ore while the skips are being hoisted and the bells being dumped by his mechanical helpers. This "one-man stock house" system requires intermittently the careful supervision of electrical and mechanical repair men. For top charging, electric bell hoists generally have first preference.

In forty years the annual requirement for pig iron in the United States has grown from nine to forty million tons. American furnaces are characterised by their large dimensions (1,000 tons) and the author believes that furnaces of this class would be well suited to the smelting of the lean English iron-stones at reduced cost and with improved furnace practice generally. The tendency to use large units is similarly pronounced with respect to auxiliary equipment.

Electric Gas Cleaning

The generation of primary electricity is usually at 6,600 V and it is distributed at 230 V DC and 220 V AC, the latter being now ordinarily used for all purposes except travelling cranes and skip-hoist motors.

Blast-furnace gas is the principal fuel for boilers and hot-blast stoves, for under-firing coke ovens and in steelworks furnaces. Their designs are such as to pass the gas through a dust catcher and washers before going through electric precipitators of the Cottrell type built by the Research Corporation.

Disintegrators are now seldom installed unless surplus gas or other sources of cheap power are available. The first cost of precipitators is somewhat higher, but they generally have a wide margin in their favour in respect of power consumption and total cost per unit of gas handled.

The American development of the electric precipitator is something quite different from either the Lodge-Cottrell or the German ones, inasmuch as the method includes the thorough scrubbing and cooling of the gas prior to precipitation, the precipitators themselves operating on cold gas saturated with moisture and the dirt being precipitated and collected in the form of thin sludge. Primary washing is accomplished in towers with rain-making devices and hurdles of various types, and for the complete recovery of the dust that is removed equipment for thickening the sludge and conditioning it for the sintering plant or its return directly to the furnaces must also be included.

A substantial economy in construction costs and saving of ground space has been effected in one of the most recent gas-cleaning installations, in which the precipitator was superimposed on the primary McKee scrubber. The cost of cleaning with this particular installation is about the lowest in American practice, so far as the author has been informed.

With plant representing an investment of $137,500 for treating 125,000 cu. ft. of gas per minute, the operating expenses per 1,000 cu. ft. are: water for primary scrubber (25 gal.) 0.01 cent and for precipitator (2 gal.) 0.0125 cent, electricity (8.96 W-hour) 0.005 cent, electrical maintenance 0.0022 cent, mechanical maintenance 0.0049 cent, and supervision and other operations 0.0034 cent. The dust content of the gas entering the washers (hot and dry) is from 2 to 5 grains per cu. ft. and its cleanliness on leaving is 0.01 grain.

Parallel Operation Problems

THE paper by Mr. T. B. Somerville on the regulation of frequency and load sharing with generators running in parallel was discussed by the London Local Technical Group of the Electrical Power Engineers' Association at Westminster on February 20th.

The author declared that frequency variations on the large systems in this country were greater to-day than on many of the larger undertakings prior to their interconnection. Because of the difficulties of obtaining sufficiently close co-operation for simultaneity of adjustment in all stations, and of obtaining accurate indication quickly of all the effects of each adjustment, more stable frequency could be achieved only by the carefully considered application of precise automatic or semi-automatic regulation.

After describing the integrating regulator designed to control load, voltage and speed, which could be regulated by impulses to a servo-motor, or simple adjusting device, a simple controller was mentioned in which impulses proportional to the frequency error were obtained by an arrangement of corridor switching contacts (as in the previous case), one being operated by a clock and the other by synchronous motor. Several variations of this principle were referred to, as well as collaboration with the boiler house and simplification of the control of its auxiliaries. For example, the use of Ward-Leonard control with DC motors was suggested as a step in the right direction, lending itself to direct linking up with the automatic governor control equipment, so that increased demand for steam could be automatically accompanied by a general speeding up of the boiler feeds.

Satisfactory operation would always depend very largely on the experience and vigilance of the central control engineer. It was suggested, however, that errors in his anticipation and estimates, and the failure of certain units to comply exactly with his intentions, should be automatically catered for in sufficient manner.

Experience During Cold Spell

Opening the discussion, the chairman (Mr. G. M. S. Sichel) pointed out that during the recent very cold weather the frequency of the whole grid had dropped half a point. What would happen under automatic control if there were not sufficient steam to maintain the proper frequency?

Mr. E. F. Hall contended that most of the trouble was due to the steam power being insufficient to restore frequency. Another aspect was that the diversity factor nowadays was beyond calculation. He mentioned one supply system on which the load at 12.30 p.m. on a particular Sunday was within 7 per cent. of that normally experienced at mid-day on Mondays, whereas normally the Sunday load was 40 per cent. below that on Mondays. The result was a frantic appeal to put into commission boilers which should not have gone into commission; on the Monday morning the load was, in fact, only 7 per cent. above that of Sunday, so that on Monday

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Transatlantic Airport (*Concluded from previous page*)

each receiver and also telephone communication. No audible sound is heard until the plane, by direct transmission on the frequency, actuates the receiver. Emergency receivers in the control tower operate directly from their own current source.

Hangar doors of steel frame and glass are hung in pairs on either side of a single steel pillar in the middle of the opening so that there is clear space when they are lifted of 163 ft. 5 in. on each side of the centre column. The doors lift electrically and turn back against the high ceiling. Operated by single switches for each section of doors, they can be hand-operated if necessary by a system of counterbalances.

The new airport is being used instead of Port Washington, Long Island, for transatlantic planes and considerably shortens both delivery and outgoing time of foreign mail from the main post office in New York.

morning the frequency was as high as it was low on Sunday morning. If operators could get back to the old economic rating and have 20 per cent. "to play with" on the boilers, they could get on. In his view it would be necessary to revert to the practice of keeping a large amount of spare plant, or to abandon m.c.r. if frequencies were to be maintained over widely varying load conditions.

Mr. Somerville, replying to the chairman, said that if frequency dropped due to insufficient plant, automatic control would merely increase the output of the generators to the limit. Disagreeing with Mr. Hall, he said that the m.c.r. system of rating generators could not be blamed for shortage of running plant, and it was a mistake to restrict the amount of plant too closely in order to save a little of the cost of generation.

The chairman said that surely the economic rating corresponded to what was originally the ordinary full load, and m.c.r. represented the margin of overload. If one operated on the overload condition there was no spare, but if one operated on the economic rating there would be the overload capacity to spare.

Mr. Hall admitted that the modern system was correct, but he said that controlling authorities now recognised m.c.r. as the normal full load, which he contended was wrong.

Mr. A. W. Connor declared that frequency control had become worse than it was only three or four years ago, and said that his electric clock was frequently inaccurate. At his station, which had to carry the load "bumps," they could anticipate the calls there were likely to be made, with accuracy, by means of a frequency indicator, so that steam was ready when required.

Adequate Plant Needed

Mr. D. Wood suggested that the problem would have been easier if there had not been any electric clocks. He urged the C.E.B. not to regard occasional hard winters as acts of God, but to bear in mind that they occurred in cycles of eleven years, and to install sufficient plant to deal with the loads likely to arise in those circumstances.

Mr. L. M. Jockel said he failed to see that there was scope for anything like the apparatus which the author had described with the grid system as at present constituted and operated, although there would be scope in the future. In some areas of the grid the frequency was a credit to the C.E.B. As to the operation of the grid, he said those responsible were adamant with regard to the way in which they operated the stations, and in abnormal weather they expected station engineers to cope with the increased loads, although it was a physical and engineering impossibility to do so. If present policy were followed, it seemed that there would have to be more peak load or emergency stations. Complaints by consumers were received by the luckless station engineers, and did not reach the C.E.B. engineers.

Transformer Protection

A CATHODE-RAY oscillograph demonstrated the efficacy of electrostatic shielding for safeguarding transformers against the stresses imposed on their insulation by surge overvoltages (as described in the paper by Mr. H. J. Thomas to which we made reference last week) at the Institution of Electrical Engineers in London on February 22nd.

Mr. C. W. Marshall (C.E.B.) opened the discussion by submitting test figures relating to transformers of five different makes. The variations in the results, he said, were strikingly indicative of the need for rationalisation in transformer design; there was obviously a very wide diversity of opinion among manufacturers as to what was necessary and desirable. At 33, 66 and 132 kV the number of failures due to over-potential was less than 1 per cent. per annum, so that it was not a major difficulty, but the elimination of even that small percentage was very important.

The most clamant need from the users' point of view was for knowledge of the impulse voltages that transformers would withstand. When all manufacturers provided that class of information, users could take the necessary and practicable steps to ensure that they did not exceed those limiting values.

Mr. E. T. Norris referred to earlier work on the subject, and said that the principles had been understood only qualitatively or even imaginatively; not until the development of the cathode-ray oscillograph and the technique of measuring inter-turn and inter-coil stresses had it become possible to "cash in" on the arduous work which had been done earlier.

It was possible to make a transformer with the insulation so designed and controlled that it provided a uniform and equal margin of electric strength for the corresponding electric stress in all parts of the winding. Increases of strength of from two to five times were possible, and he believed it was possible to go still further, but doubted whether it was necessary. Failures due to lightning were not extremely frequent. The chief difficulty was inter-coil stress; inter-turn stresses were relatively very small, due to the natural construction of coils, but in testing quite a large number of transformers to destruction he had not experienced a single case of failure between turns, yet indisputably failures had occurred between turns in service, due to lightning. Thus there was still much to be learned.

Dr. T. F. Allibone said that the method described by the author was strikingly neat. The shield appeared to be quite cheap, except perhaps for the investigational work, which had to be done on every design of transformer before the shield could be formulated on paper. But he was concerned about the degree of improvement achieved; was it sufficient to justify the introduction of the shields? As to the so-called non-resonating shield, it would be difficult to attain the theoretically requisite value of capacitance at the extreme line end, and so it was not fair to call the winding non-resonating. With regard to the modified or simplified design, the reduction of stress across the first one-fifth of the winding did not appear to be great enough to warrant the complication involved. Was the reduction of stress sufficient to prevent breakdown of the major insulation in the axial direction?

Safety Factor

Dr. J. L. Miller said that an ordinary transformer when subjected to travelling waves had a safety factor of 2/1 or more in the major insulation direction and a factor of weakness of about 1.4/1 in the axial direction. If that were not true generally, there would have been no need for the development of the non-resonating transformer. That was an economical way to ensure that inter-coil failure under impulse conditions would not occur before major insulation breakdown. Also, a surge absorber acted as an effective insulation co-ordinator, provided ample security for the major insulation, and might be a better economic proposition than the non-resonating design; it could be added to existing transformers.

As to stresses in bobbin-wound coils, he agreed that a single coil might have a very good distribution between layers. The voltage between turns, however, was about 50 times average at the extreme end. The mystery deepened in cross-over coil transformers with eight layer-wound coils, the first coil carrying reinforcement, there being voltages between the first and second and between the second and third layers of 16 and 19 times average, respectively. Despite that severe concentration, possibly due to the reinforcement, the maximum gradients occurred about 8 per cent. away from the line end, thus behaving as disc-wound transformers.

Dr. E. Billig suggested that an increase of inter-coil insulation did not appreciably affect the capacitance between the coils, bearing in mind that there was not only the solid insulation, but an oil duct. That the effect would not be so severe as the author had suggested was borne out by the fact that only a small number of properly designed power transformers had broken down between coils. The position might be different in potential transformers, in which it was difficult to provide extra insulation without interfering with heating and capacitance values; but he did not think it was worth while interfering with the neat design of modern power transformers by fitting large shields, which might increase the likelihood of trouble occurring sooner or later.

Mr. H. M. Lacey said he imagined that in no case in this country could one justify an expenditure, for protection, amounting to more than 10 per cent. of the original cost of the transformer. That was based on the assumption that the protection provided was perfect, which could be obtained only if the peak voltage were brought down to the figure which the major insulation would stand, and if precautions were taken to ensure that the wave fronts were such that the end-turn insulation would not be over-stressed.

Objection to Terminology

Prof. C. L. Fortescue protested against the terminology which was growing up around the subject. He said that the term "resonating transformer" was a misnomer, and the so-called "shield" was a means of adding to certain capacities. When the same thing was done to a string of insulators it was called "equalisation," and such a term would be more appropriate than the word "shield."

Mr. Thomas, replying to Mr. Marshall's reference to the use of a 26-in. rod-gap on a 132-kV circuit as being about the minimum which could be used without causing unnecessary interruptions under normal operating conditions of switching, said it indicated that the use of a gap as a protective device was a compromise. One must compromise or choose between two conflicting requirements; the operating engineer must decide between having proper protection against surges and the possibility of an occasional interruption due to a switching surge. The manufacturers were prepared to carry out an acceptance test at any prescribed level of impulse voltage and

guarantee that the transformer would not break down, but a manufacturer could not reasonably be asked to disclose the margin.

A simple coil consisting of many concentric layers had very substantially linear distribution, but although that type seemed to offer great possibilities, it did not appear to be a practicable construction for high-voltage power transformers, although he believed that some progress had been made in Germany. He agreed that it was difficult to attain the theoretically requisite value of capacitance at the extreme line-end, but all it meant was that perhaps a few higher harmonics of relatively small amplitude were introduced near the line-end. The surge absorber or wave front flattener would also reduce inter-coil and inter-turn stresses, and the choice between that method and the shield was probably a matter of economics.

Boiler Developments

IN describing the development of steam boilers and their auxiliaries in a paper which was well illustrated diagrammatically presented to the Manchester Association of Engineers on February 23rd Mr. A. Pollitt (London Power Co.) drew largely upon his own experience and endeavoured to indicate such trends in design as might not have become sufficiently established in practice to be referred to in standard works.

Attention was first directed to the striking increase in size and output of single natural circulation units. There appeared to be a general tendency for large power stations to adopt the bent tube type, a swing that could also be noticed in the U.S.A. Increased steam pressure had probably played its part in this connection, since the large number of joints required for hand-hole caps, &c., in the header type was eliminated, thus reducing the possibility of leakage and outage time required for annual overhaul.

The author limited his remarks on forced circulation to the La Mont boiler at Deptford (West) with a description of how repairs could successfully be made to close pitched water walls without dismantling or access at the back of the wall. Improved technique of heat transfer from flue gases to water and steam within the tubes had reduced the amount of boiler surface needed. The amount of work to be done by the purely convective surface of the boiler proper had been reduced tremendously by the provision of extensive radiant water walls, unprotected by refractories and so closely pitched as to present an almost complete metal wall within the combustion chamber. In addition, greater feed water heating by bled steam and extensive use of economisers had reduced the sensible heat to be added to the steam. Higher pressures had considerably reduced the latent heat needed to convert water at saturation temperature to steam, and as the temperature of the latter was raised the work to be done by the superheater became a greater proportion of the whole heat to be added.

Superheater Design

Thus prominence was given to the design of superheaters which became larger and were gradually moved forward towards the combustion chamber. The two-stage pattern resulted from the need for more accurate temperature control within them, for tube-metal preservation. To avoid overheating with steam at 900 deg. F. most modern plants used thermostatically actuated dampers to by-pass some of the flue gas, or desuperheaters or attemperators of several types to cool the steam partially with water.

At Battersea "B" double security would be secured at 965 deg. F. by camshaft dampers operated by small motors, remotely regulated for general adjustment, combined with desuperheaters to do the final regulation automatically.

Economisers had become integral parts to such an extent that in some a percentage of steam was actually formed and led to the boiler drum. Sometimes they were split into two banks, partly counter and partly parallel flow. Space was saved by using tubes with gills on the gas side.

Regarding combustion air preheaters, while there was a limit of about 350 deg. F. for chain grates up to 500 deg. F. could be used with retort stokers, the flue gas temperaure being reduced to 230 deg. F. in the case of high efficiency base-load boilers. Tubular air heaters were essentially simple; plate types lent themselves to more compact arrangements, so occupying less space, but the relatively narrow spaces between the envelope leaves made them more liable to choking on the gas side. The regenerative type with a slowly rotating honeycombed drum needed considerably less space than the other two, but leakage was inevitable due to the moving parts, becoming more serious as the size increased. Seals developed by the London Power Co. had reduced CO_2 drops in large air preheaters from 3.5 to about 1 per cent.

Some large power stations had induced and forced draught totalling 25 to 30 in. w.g. Physical layout in the space available usually determined the number of fans to be used and also whether they should have single or double inlets, a single inlet fan usually being narrower and of greater diameter. The backward bladed type was particularly suited to forced draught service, being capable of increasing the static pressure without reducing volume or overloading its driving motor.

High blade-tip speeds might necessitate the use of special alloy steels. Instead it might be more economical to choose radial or paddle fans, whose static efficiency was not so high. Their static pressure/volume curve was steep, so the pressures generated must be estimated with particular care to avoid overloading the motor.

The forward-curved or multi-bladed fan had a flat pressure curve and was liable to undulate, so being quite unsuitable for operation in parallel; its static efficiency was lower and the power absorbed rose rapidly with increase in volume. But this type generated more pressure at a given tip speed; hence space required was less. Backward and even radial bladed fans were unsuitable for dust-laden gas due to accumulation of deposits on blade backs causing out-of-balance vibration.

Fan output control could be by means of dampers with constant-speed driving motors; by speed changing with DC motors, or the Ward-Leonard system, or hydraulic couplings, &c.; or by vanes with constant-, two- or three-speed motors. The author's preference was for the two-speed vane method, since its efficiency was comparable with that of variable-speed fans without the latter's complications. This preference should be qualified by careful selection of fan duties in relation to boiler operating conditions.

Stoker firing still predominated in this country; chain grates could be built for evaporating up to 350,000 lb. per hour and retort stokers for 600,000 lb. per hour, tests made by the London Power Co. being referred to.

Somewhat exaggerated claims had been made for boiler control systems. The general tendency, in this country at any rate, was to use remote hand control, the development of which was traced by the author, including electrically controlled feed water regulation of the very latest kind, and the advantages of automatic soot blowing.

Coal and Ash Handling

Descriptions of coal and ash handling at Deptford and Battersea showed that the latter's designed final capacity of 550,000 kW at 55 per cent. load factor would involve the consumption of 965,000 tons of fuel per annum. Local storage sufficed for 37 days' average needs, the coal being principally sea- and river-borne in ten colliers of from 2,000 to 3,500 tons each. For large-capacity ash handling the simplest scheme was some form of hydraulic sluice.

Boiler feed-water pumps were by far the most important auxiliaries and they absorbed the greatest proportion of the auxiliary power. Hence their design needed the greatest care, their size and power absorption being almost directly proportional to the operating steam pressure.

The Battersea "B" plant would consist of back-pressure turbines exhausting into secondary turbines. To allow for the primary plant being out of service the motor-driven feed pumps had been split into two sets to operate in series. The first would provide 785 lb. per sq. in. pressure (which, when operating alone, would suffice for the 600 lb. boilers) and the second would add 900 lb. to make up the 1,685 lb. required by the extra-high-pressure boilers. Two-speed steam turbine pumps would provide similar results.

Reciprocating pumps were highly efficient, but costly and heavy, and required more space. A high-speed reciprocator might become available in the near future, which would overcome many of the disadvantages of the low-speed type.

After reference to feed-water treatment for the Battersea "A" and "B" plants, the newer section combining both closed-feed and deaerator systems, the paper concluded with a brief mention of flue gas washing plant.

Control of Mine Winding

A LONG discussion followed the reading of a paper at Cardiff on February 24th before the South Wales branch of the Association of Mining Electrical Engineers by Mr. T. G. Dash, who explained that during the past two years all colliery engineers had been faced with the installation, maintenance and testing of "slow-banking" equipment, which was necessary to comply with the Mines Department Statutory Rules and Orders (Winding and Haulage), 1937, No. 143. He considered the time now opportune to discuss the performance of the various types, which could be divided into those whose operation depended upon (*a*) the action of a centrifugal governor, such as the Lilly controller, duplex Lilly controller and the Barclay high-speed governor; and (*b*) hydraulic action, including the Lilly controller with hydraulic slow

(Continued at foot of page 247)

IN THE COURTS

By Our Special Reporter

Alleged Infringement of Registered Designs

IN the Chancery Division last week Mr. Justice Bennett continued the hearing of the actions by the Benjamin Electric, Ltd., against Veritys, Ltd., for the alleged infringement of the plaintiff's registered designs. Defendants denied the allegation and they also pleaded that the designs were not new or original and further pleaded prior publication and prior general common knowledge. The defendants by two motions sought the expunging of the plaintiff's designs from the Register. The opening of the case was reported in our last issue.

The plaintiffs' case was that their reflector had won a high reputation in the trade and that they had sold more than three quarters of a million of them. The reflector was known under the name of "Coolicon," and their complaint was that the defendants had manufactured, advertised, and put on the market a reflector under the name of "Kooltop" which plaintiffs alleged was an infringement of their designs.

At the close of the plaintiffs' case Mr. J. Mould, for the defendants, said he would call his evidence first and address his Lordship later.

Mr. F. W. Thorpe of Birmingham, electric light fittings manufacturer, said he had had fourteen years' experience in the trade. He had known dome shades imported from Germany some years ago with a gallery for ventilation at the top. Dome shade reflectors with conical tops were quite common all over the world. In his view there was a marked difference between the plaintiffs' and defendants' reflectors. He further expressed the opinion that the plaintiffs' reflectors were not original in design.

Mr. Thorpe was cross examined in great detail by Mr. Jacobs as to the alleged similarities in the plaintiffs' and the defendants' reflectors.

On February 23rd, at the conclusion of the arguments of Counsel, his Lordship in giving judgment said that the plaintiffs' first action concerned registered design No. 777,912. Mr. Iliffe had given evidence for the plaintiffs and his Lordship regarded him as an honest and truthful witness. The plaintiffs' design was very successful and had sold in large numbers and proved popular. The plaintiffs' case was that the canopy and upper part of their reflector had never been produced before and was a new design. Defendants' reply was that there was nothing new or original in the screen. In this case it was necessary to have regard to small matters. It was clear that there were differences between the plaintiffs' design and those shown in the prior documents. There was nothing like the plaintiffs' design until it was put on the market. He thought that the plaintiffs produced something which was original and required originality for its production. In his judgment the plaintiffs' design was one properly entitled to be registered and there was no ground for taking it off the Register. The defendants, therefore, failed on that part of the case.

He had then to consider whether the defendants' production was an infringement of the plaintiffs' design for reflectors. There was a somewhat close resemblance but there were some slight differences from the plaintiffs' design. Was the defendants' reflector a fraudulent or obvious imitation of the plaintiffs' design? He (the Judge) held that the defendants' reflector was *not* an infringement of the plaintiffs' design—it was not a fraudulent or obvious imitation of the plaintiffs' design. The differences between the defendants' and plaintiffs' reflectors were quite marked. The defendants were therefore entitled to succeed because they had *not* infringed the plaintiffs' copyright. In that action the plaintiffs necessarily failed. The defendants' motion to rectify the Register also failed and the result was that the motion and the action failed and both were dismissed with costs.

With regard to the second action as to the registered design No. 752,957, his Lordship said he had no difficulty in finding that the defendants' reflector was an obvious imitation of the plaintiffs' registered design and a copy. They had infringed the plaintiffs' copyright and plaintiffs were entitled to the relief they claimed with costs and the defendants' motion would be dismissed with costs. His Lordship in that case granted the plaintiffs the injunction they asked for and an inquiry as to damages. He also directed that there should be a set-off as to the costs.

Cutting-off Application Refused

At Kirkcaldy Sheriff Court recently Sheriff Substitute J. W. More dismissed the application by Kirkcaldy Corporation to cut off the supply of electricity to a local trader. The application was on the grounds that there were arrears amounting to £8 7s. 11d. in respect of electricity supplied. For the Town Council an agent explained that the application was made under the Electric Lighting Act, 1882, which gave the Corporation power to cut off the supply until such charges were paid. When respondents' agent asked to see the contract between the Corporation and the trader for the supply of electricity, it was explained the contract had been made many years ago and had since been destroyed by fire.

The view of respondents' agent was that the Corporation was not entitled to proceed with the application, and he contended that the whole proceedings were incompetent and irrelevant. He stated that the Corporation wanted to cut off the supply until the amount was paid, and the reason for the application in his submission was for the purpose of forcing payment of debt. In dismissing the application the Sheriff awarded expenses of one guinea to the respondent.

Juvenile Labour on Sundays

At Hamilton Sheriff Court on Friday, February 23rd, an engineering firm was fined £2, with 17s. 9d. expenses, for employing eight youths of under 18 on a Sunday. The lads were engaged on making switchgear for collieries, and the Factory Inspector said he was informed there was no particular urgency in the work.

An agent for respondents explained they had lost eight of their adult staff when the Territorial Army was mobilised. Coal companies were pressing the firm for delivery of switchgear. The times were exceptional, and many firms were finding it difficult to cope with orders and to get skilled operators. The Sheriff agreed that the times were exceptional, but said he had to recognise that there had been a distinct breach of the Factories Act.

Institution Proceedings (*Concluded from page 246*)

banker, the Mellings' hydraulic dashpot, and the King's "sun and planet" gear with hydraulic dashpot.

All these appliances had two things in common, i.e., accurate distance or travel and speed-measuring devices, and Mr. Dash said that success depended entirely upon the brake engine giving a reasonably good performance. A number of these equipments had been tested and different rates of operation had been found between various types of brake engines and also between similar types. The speed at which the brakes were applied depended upon a number of factors, but it could be generally stated that any excessive delay was attributable to inadequate exhaust port openings.

Cosmic Ray Research

SOME recent developments in the investigation of cosmic rays formed the subject of the twenty-fourth Guthrie Lecture of the Physical Society, which was delivered in London on February 26th by Prof. P. M. S. Blackett (Manchester University).

He explained that the most important realisation of recent years was that the hard or penetrating component of the rays consisted of particles of a new type, called the mesotron, which had a mass intermediate between that of the electron and the proton and possessed the peculiar property of being spontaneously unstable. Its average life when at rest was about one millionth of a second, but when moving fast it lived longer, thus providing a nice verification of Einstein's principle of relativity.

Some of the rays incident on the earth's atmosphere had an energy certainly as high as 1,000 billion volts, which was probably not the limit. Particles of such great energy had very peculiar properties; instead of producing a narrow track of ionisation a fraction of a millimetre broad like normal atomic tracks, they made a track many metres broad. This was deduced from relativity theory, but had not yet been verified experimentally.

Great interest was attached to the "spectrum" of the rays incident on the earth's atmosphere, since it could be represented roughly by a simple power law over the range of energy of over a million to one. More precisely, the number of rays with energy greater than some given value was roughly inversely proportional to the square of the energy over the energy range from a thousand million to a thousand million million volts. It could hardly be doubted that this remarkable law must have some profound, but at present unknown, cosmological significance.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Future of the Electric

I WELCOME the useful article in your issue of February 16th. There is, however, one sentence in it which is likely to give a very wrong impression. It reads "If it were possible for the traction battery manufacturers to come to some agreement as to the production of a standard battery, the position would, of course, assume enormously increased possibilities."

On behalf of the traction battery manufacturers, members of my Association, I can assure you that it is not only possible but would be very welcome to them. I think also members outside our Association would agree with me that it presents no difficulties at all, and we all have always been ready to co-operate with the vehicle manufacturers to give effect to it. As a fact, battery manufacturers can and do supply standard batteries and have done so for many years. This is proved by the fact that renewal batteries are every day supplied practically from stock to replace those of other makes on existing vehicles. Most of the leading vehicle makers supply their vehicles with a choice of most of the leading makes of batteries, so that these, at any rate, are interchangeable.

The trouble is that the vehicle makers do not standardise on a standard battery, or even a reasonable range of them. The result is that the battery maker has to supply a large number of different sizes and shapes of cells, particularly as regards height. The same applies to voltage or number of cells.

In modern practice lead acid batteries of any of the well-known makes for the same capacity occupy the same cubic space, and all approximately give 10-12 watt-hours per pound of cell, although more can be obtained, of course, at the expense of life.

Exactly the same difficulty has been experienced in the past with starter batteries for petrol cars, the standardisation of which one would think was a comparatively simple matter. These have been standardised in some Continental countries officially and also in America, but the car manufacturers do not appear to pay any attention whatever to these standards.

I am sorry to say the same thing applies to a great extent to stationary batteries. These were standardised through the B.S.I. and agreed to by all interested parties, including, of course, Government Departments, and the Specification was agreed, published and adopted. Even now, however, few of the interested parties observe the standards agreed upon when drawing up their specifications. Unfortunately you can take a horse to the water, but you cannot make him drink.

London, S.W.1, *February 26th.* E. S. NEW,
Chairman, Accumulator Makers' Association.

Warming Large Buildings

There seems to be some uncertainty as to the best methods of conveying hot water for heating large buildings and in new schemes in which electricity provides the source of heat some of the more obvious difficulties should be avoided.

A few years ago a large school was built in the north and the rooms were supplied with great windows and with long verandas outside to ensure air and sunshine. Unfortunately the authorities did not recognise the effect of this during cold winters and they provided heat from the ceilings instead of on the ground level. The idea seemed to be that as the sun heats from above, the rooms should be heated by radiant heat from the ceilings. The result was that in the winter the temperature went down to 40 deg. F. and the scholars sat shivering in their overcoats and could not do their work. Improvements were made in the summer and now the temperature has gone to 42 deg. in cold weather and the scholars have to go to another hall, where, however, the rooms become too hot in the afternoon.

A second school built in the district was provided partly with pipes and radiators on ground level and partly with ceiling heating, but rooms with the latter system are too cold for work in the winter. A large hall recently opened in the same district also has ceiling heating. The opening day was cold, and although the heat had been on long beforehand, those present kept their overcoats on during the meeting. One felt the heat beating on one's head but one's feet were cold. The more satisfactory old Roman method made one's feet warm as the floor was heated, while one's head might be in cool air. The hall would undoubtedly have been better heated if there had been radiators to warm air which came in at the doors and also a hot pipe along the wall with its large windows.

Even with floor-level heating there are difficulties. In churches one sometimes finds the wall space warm but cold draughts come down the middle of the building. Also between each set of pews the walls are covered with dust which rises from the pipes. The dust seems to be electrified by heat and it sticks to the wall and cannot be rubbed off. As an example of successful heating one may mention a set of offices in an electricity department, where hot-water pipes with radiators are run along the wall with windows and the offices are kept comfortable. On moderately cool days some windows may be opened and as the cool air coming in mixes with the hot air from the pipes the rooms are fresh and warm. In very cold weather an occasional electric fire keeps the temperature up but this is rarely necessary. The whole subject of heating requires research and one is glad to note that it is to be undertaken. NORTHERNER.

February 23rd.

Sales to the Central Board

Many of those in the electricity supply industry are becoming accustomed to the use of an expression which, though perhaps not so unhappy as the "evacuation of children," is inaccurate and misleading. I refer to the use of the words "Units exported to the C.E.B." What we mean to refer to is "Units supplied to the C.E.B. for export."

I would suggest that before the using of this wording becomes a habit we should adopt a more accurate description of what we really mean and would propose—if we wish to be brief—the use of the words:—"Units (supplied) to C.E.B. for export." R. P. SLOAN.

Moretonhampstead, *February 24th.*

Chief Engineers' Salaries

The letter signed "Constitutional" on page 219 of your February 23rd issue is inaccurate, and would do much harm except for the fact that the inaccuracies are so obvious. "Constitutional," in his historical preamble goes completely wrong, then proceeds to discuss the position "in the light of this (necessarily brief) history."

It is *not* a fact that a new scale of salaries for chief engineers has recently been agreed and submitted to the District Joint Boards for approval. The new scale has not yet been agreed; moreover, when it is agreed it will not under any circumstances be submitted to the "District Joint Boards" for approval. I refrain from any comment on the further portion of the letter because the foundation is wrong.

It is difficult to visualise a more complete misunderstanding of any matter than that which is revealed by "Constitutional," and it is unfortunate that writers to the technical press should indulge in comment on matters which they have not taken the slightest trouble to investigate.

Manchester, *February 23rd.* A. H. BANKS.
Employers' Secretary.

Washing-machine Butter

During the recent severe weather farmers in our area experienced great difficulty in transporting milk to their customers owing to snow-bound roads. Several farms had supplies of milk on their hands from four to six days and all containers were full.

One imaginative farmer decided to make butter and did it most successfully with an electric washing machine. He told the writer that it was much easier than churning, and he made use of the washing machine for the greater part of one day. The whey was allowed to filter through the draining plug. An inspection of the washing machine revealed that it took no harm whatsoever, and the farmer himself is loud in his praises of electricity for the farm.

W. MADDISON,
Macclesfield, *February 21st.* *Consumers' Engineer.*

I.E.E. Scholarships

APPLICATIONS are invited, not later than April 15th, 1940, by the Institution of Electrical Engineers, Savoy Place, London, W.C.2, from which particulars and nomination forms are obtainable, for five scholarships varying in value from £100 to £250 per annum for from one to three years, three of them being open to students or graduates and two to works employees.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AT the annual meeting of the Institute of Export on February 20th **Sir Patrick Hannon,** M.P., was re-elected president of the Institute and **Mr. R. J. Turner,** export manager of C. C. Wakefield & Co., Ltd., was re-elected chairman of the Council. **Mr. N. R. Crute,** director of the International Lead Oxide Convention, International White Lead Convention and Associated Lead Manufacturers Export Co., Ltd., has been elected treasurer of the Institute in succession to **Mr. T. H. Thatcher,** who has retired from that office. A presentation has been made to Mr. Thatcher by his colleagues on the Council.

Mr. J. A. Sumner, deputy borough electrical engineer at Derby, has been appointed city electrical engineer at Norwich at a salary of £1,500, rising to £1,700 per annum. Mr. Sumner served his apprenticeship in mechanical engineering at Beck Works, Nottingham, and after serving in the Royal Air Force during the last war he studied at the University College, Nottingham, from 1919 to 1922, and during the latter year joined the Derbyshire and Nottinghamshire Electric Power Co. In 1925 he was appointed chief assistant engineer with the Mid-Cheshire Electric Supply Co. at Northwich, and five years later joined the West Midlands J.E.A. as distribution engineer, later becoming chief distribution engineer. He was appointed deputy borough electrical engineer at Derby in June last year. Mr. Sumner has presented two papers before the I.E.E. on "Private Plants and Public Supply Tariffs," and on domestic load and tariffs.

[Elliott & Fry.
Mr. J. A. Sumner

Mr. H. R. H. Surman, who has been on the staff of the Oxford City Electricity Department and is now serving with the B.E.F., was married at St. Margaret's Church, Oxford, recently to Miss H. N. Giles, who has also been on the staff of the Electricity Department.

Ald. W. H. Giles and **Councillor A. Harrison,** of Burton-on-Trent have been appointed members of the East Midlands Electricity Advisory Board for 1940.

Mr. R. F. Burston, A.M.I.E.E., has been appointed assistant mains superintendent with the Greenock Corporation Electricity Department, and takes up his new duties on March 4th. Since 1935 Mr. Burston has been district mains engineer with the North Wales Power Co., and before that was mains superintendent with the Wolverhampton Corporation Electricity Department.

Mr. W. L. M. French, A.M.I.E.E., is leaving Leeds Corporation Electricity Department to take up a position as shift charge engineer in the power stations of I.C.I., Ltd. (Castner-Kellner Alkali Co., Ltd.). When in Leeds he took a keen interest in the I.E.E. Students' Section, and was the author of a paper on the "Automatic Control of Modern Steam Generators," which was awarded a premium. Mr. French was combustion engineer when Kirkstall power station was commissioned, and for some time after that held the position of senior shift boiler-house engineer and relief shift charge engineer.

The Ipswich and District Electrical Association this year combined its annual dinner with its annual dance and the function, which was held on February 23rd, attracted a large gathering, over which **Mr. S. F. Steward** (chairman of the Association) presided. The toast of "The Association" was proposed by **Dr. J. W. Hunter** (Medical Officer of Health for Ipswich), who mentioned that the Association had been in existence for seven years. The medical profession was indebted to the electrical industry for its contribution in the matter of diagnosis and treatment, but there was still a lot more to be done in that direction. Speaking of the ways in which electricity could help in improving the health of the community, he said that this winter had proved that better ventilation of buildings was necessary, especially in these days of black-out.

Mr. G. A. Vowles (president of the Association and engineer and manager of the Ipswich electricity and transport undertaking), in reply, said that the membership of the Association was sixty, and it was made up of those connected with the electrical industry in all its aspects in the Ipswich district, but there was still room for others to join. The objects of the Association were to promote fair trading, co-operation, and interchange of knowledge and to see that its members were able to give efficient service to the public. Membership of the Association was a guarantee of high workmanship. The effect of the war on the electricity supply industry was likely to be far-reaching, but he did not think the black-out would be disastrous. It had shown the value of a highly efficient artificial light, and he believed that with the return of normal conditions there would be a greater return to the use of electricity. He warned consumers against the dangers of inefficient electrical installations in underground shelters where damp conditions prevailed, and advised them to employ the best men possible when carrying out such installations.

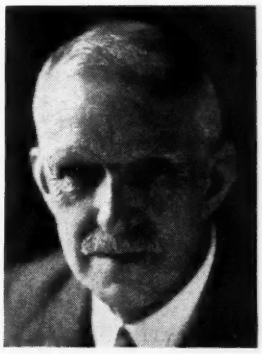
Mr. Steward, proposing the health of the visitors, said that the efficiency and prestige of the Ipswich undertaking stood higher than ever before. The war had placed some vital tasks on the electrical industry, and he was sure that in due course the resources and experience of electrical contractors would be mobilised in the national effort.

Mr. S. C. Grimwade (chairman of the Ipswich Electricity Committee), in responding, mentioned that the Association had helped to foster the spirit of co-operation between the Corporation and the electrical traders in the town. He considered that the outlook of the undertaking was very bright, especially if they continued to encourage the domestic load. After Mr. Steward had expressed his thanks to Mr. W. H. Howell, hon. secretary, and the committee for their work in connection with the function, the floor was cleared and dancing continued until the early hours.

Mr. J. E. Hart, Grad. I.E.E., has been temporarily released from his appointment as consumers' engineer with the Shoreditch Borough Council Electricity Department to take up a position in connection with the Central Register of the Institution of Electrical Engineers.

In these "black-out" evenings one might imagine that dances and other social events would be less popular than in pre-war days, and it was with this thought in mind that we made our way to the Baltic House, Leadenhall Street, E.C.2, on Saturday last, to attend the annual dance arranged by the Joint Committee of the Students' and Graduates' Sections of the Institutions of Civil, Mechanical, and Electrical Engineers. Not only, however, was the dance better attended than last year—between 300 and 400 were present—but all were at their jolliest. **Mr. P. H. Pettifor,** who was largely responsible for arranging the function, was proud of the fact that 200 of the company were "Electricals," and he is to be congratulated on the work that he and his associates put in to ensure a very enjoyable evening.

At a luncheon held at the Clarendon Restaurant, Hammersmith, on February 24th, a presentation was made to **Mr. A. Vines,** who recently retired from the post of joint managing director of Evershed & Vignoles, Ltd. He was appointed works manager of the company when it was first formed in 1895, and from 1909 was a joint managing director. From small beginnings with a total personnel of eight, the business has steadily grown until at the time of his retirement over 1,000 operatives were employed. He still retains a seat on the board of directors. He chose as the subject for the presentation an album containing portraits of his co-directors, department managers, and other senior members of the staff. Colonel W. A. Vignoles, a present managing director of the company, in presenting the album to Mr. Vines, paid a warm tribute to his personal qualities.



[Elliott & Fry.
Mr. A. Vines

Mr. Vines, who was educated at Emmanuel College, Cambridge, is a member of the I.E.E., a member of the Council of the Management Board and Conference Committee of the Engineering & Allied Employers' National Federation, a past-president and trustee of the Engineering & Allied Employers' London & District Association, vice-president of the British Engineers' Association, vice-chairman of the British Scientific Instrument Research Association, and chairman of the Economic League, London & Southern Counties.

Mr. Herbert Bell, general manager of Glasgow Corporation Electricity Department for twelve years, is resigning for health reasons. The Electricity Committee has agreed that Mr. Bell's resignation should take effect as from May 31st, and it has appointed **Mr. G. Morgan,** assistant manager, as acting manager. The Committee has appointed a sub-committee to deal with the vacancy.

Mr. H. C. White has been appointed manager of the Manchester Branch of Philips Lamps, Ltd., and took over his duties there on February 19th.

Mr. J. R. J. Bowden, A.M.Inst.C.E., A.M.I.E.E., deputy borough electrical engineer to the Metropolitan Borough of Hackney, has been presented with a radio-gramophone as a token of esteem and affection from his colleagues in the Electricity Department and the chief officers and friends in other Departments of the Council, on his retirement after forty years' service.

The King has awarded the Edward Medal to **John Dixon** (27), electrician, of Lincoln, in recognition of his gallantry on February 16th when an accident occurred at the foundry of Robey & Co., Ltd. Two overhead electric cranes and a foundry roof were set on fire, and Dixon rescued the driver of one of the cranes, a man named Whittaker, who had collapsed on the top of the crane with his clothing ablaze. Dixon saved the man although the fire was at its height and there was also risk of his sustaining an electric shock. He extinguished the flames from Whittaker's clothing and carried him from his own crane across the crane in the next bay, out on to the roof gutter, then along across the roof, and down a vertical ladder 31-ft. in length to the ground.

Mr. J. G. Kellie, borough electrical engineer at Stafford, has been co-opted a member of the Consultative Technical Committee to the Central Electricity Board.

The University of Oxford has decided to confer the honorary degree of D.Sc. on **Dr. E. V. Appleton,** formerly Wheatstone Professor of Physics at King's College, London, and Jacksonian Professor of Natural Philosophy in the University of Cambridge. Dr. Appleton is secretary of the Department of Scientific and Industrial Research.

The employees of the L.P.S. Electrical Co., Ltd., Ealing Road, Alperton, cable manufacturers, gave an entertainment by way of a dance-social to the members of the forces stationed at Alperton on February 23rd. It is the intention of the employees of this company to give similar entertainments to the members of the forces frequently throughout the war. For this purpose they have formed a fund which is added to weekly out of their earnings, and supported by the management.

Obituary

Col. R. E. B. Crompton.—A memorial service to the late Col. R. E. B. Crompton, arranged by the Institution of the Electrical Engineers, was held on February 22nd at St. Margaret's Church, Westminster, Canon V. F. Storr officiating. The Institution of Electrical Engineers was represented by Mr. Johnstone Wright (president), Sir Archibald Page, Mr. H. T. Young, Dr. A. P. M. Fleming, Mr. F. Gill, Mr. J. S. Highfield, Dr. A. Russell, Mr. J. M. Donaldson, Dr. C. C. Paterson, Lt.-Col. K. Edgcumbe, and Mr. R. T. Smith (past-presidents), Sir Noel Ashbridge, Mr. J. R. Beard, and Prof. C. L. Fortescue (vice-presidents), Messrs. E. Leete, A. L. Lunn, and H. Joseph (members of the Council), and Mr. W. K. Brasher (secretary). There were also representatives of the Royal Society, the Institutions of Civil, Mechanical and Automobile Engineers, and a large number of well-known men in all branches of the electrical industry, including Messrs. F. Parkinson, J. Harwood Fryer, C. F. Dickson, and F. Le Neve Foster and members of the staff of Crompton, Parkinson, Ltd.

At the meeting of the Institution of Elecrical Engineers on February 22nd the President (Mr. Johnstone Wright) referred to the great loss which the Institution, the electrical engineering profession and the electrical industry had suffered by the death of Colonel Crompton, who had been twice president of the Institution and was also an Honorary Member and a Faraday Medallist. The meeting observed a brief period of silence in tribute to his memory.

Mr. Harry Wauchope, chief electrical engineer of the Southern Railway Docks & Marine Department, whose death we announced in our last issue, was educated at Kelvinside, Glasgow, and served his apprenticeship with the North British Railway, obtaining his technical education at Glasgow Technical College. He had some experience in the civil engineering office of his father-in-law, Mr. R. H. Brunton, M.Inst.C.E., in London, after which he sailed in the P. & O. line as one of the first seagoing electricians. He later joined the British Aluminium Co. at Birmingham and after a few years commenced his career with the South-Western Railway on the Waterloo and City line. In 1910 Mr. Wauchope was appointed chief of the newly created electrical department at the London and South Western Railway Dock at Southampton. When he took charge the supply was produced by a small steam driven generating station. In 1924 a comprehensive scheme of electrification of all pumping machinery was carried out and this, together with the progressive installation of electric cranes, lifts and other apparatus, necessitated the Southern Railway purchasing electricity in bulk from the Southampton Corporation. Mr. Wauchope was sixty-three years of age.

Mr. Thomas Burn, manager for Robson and Coleman, electrical engineers, Newcastle-on-Tyne, has died aged fifty-one. Mr. Burn, who was born at Newcastle-on-Tyne, had been with Robson and Coleman for many years and was foreman before being appointed manager.

Mr. Henry James Ryder, whose death has taken place at the age of fifty-five, was principal of Henry J. Ryder, Ltd., electrical engineers, of Uttoxeter. For six years he had been a member of the Urban District Council.

Mr. John Campbell Macnab, partner in Lockhart & Macnab, electricians and engineers, Stirling, has died in his sixty-sixth year. From 1927 to 1930 he was a member of Stirling Town Council.

Electric Vehicles

A Battery Maker's View

THERE is an old saying, "A poor workman complains of his tools." Whenever an electric vehicle manufacturer makes excuses for his failure to increase the use of his product in this country, as he frequently has to do, he invariably puts the blame upon batteries and battery makers.

Mr. H. G. Wilson, in his article in the ELECTRICAL REVIEW of February 16th, proves no exception to this rule. I read: "What prevents it [the electric vehicle] ousting the motor car and becoming the most universally used type of modern road transport? Nothing, nothing at all but the battery."

Wherever electric vehicles are in use it is an established fact that the electric vehicle is not a competitor of the petrol vehicle, but has a sphere of operation in which the petrol vehicle cannot compete successfully. I have never before heard it suggested that the electric vehicle could, or would, oust the petrol vehicle. Mr. Wilson might quite as usefully ask why battery-driven trains have not ousted those driven by steam, and the answer would be the same. We all know the hardy annual of the new battery, generally primary, which is going to drive an Atlantic liner to America for fourpence, but we don't wait for it. We laugh and get on with our job.

Again, I see a diagram purporting to show the "power relation of battery and petrol weights," whatever that may mean. I wish I could draw a similar diagram of "power relation of petrol to electric unit weights," but I find myself unable either to draw a unit or weigh it. This is a pity as it would be so useful. Why does not Mr. Wilson give us the relative weights of a one-ton petrol lorry chassis with tank full of petrol and a one-ton electric chassis complete with battery? There would not be such a great difference. I suggest that the electric vehicle makers might quite as well complain to the supply engineers that their "juice" has not got as much "pep" or power in it as petrol has, or as they ought to provide to enable the electric vehicle to drive the petrol car off the road.

Mr. Wilson's excuses do not explain why the German Post Office alone have more electric vehicles than the total used for all purposes in Great Britain, nor why Germany has 27,000 electrics in operation against our 5,000. They have not any better or more efficient batteries, rather the reverse.

I also look back over the years—some 40 or more—as a battery manufacturer who has driven most of the electric vehicles from an electric cycle to an omnibus, and I can give you the "real reasons for this overwhelming majority" without fear of contradiction. They are two. Until quite recently no British manufacturer of electric vehicles had, first, much knowledge or experience in the manufacture or marketing of a motor car, and secondly, was not prepared to find the necessary finance to do so on a paying scale.

Some years ago the British G.P.O. were persuaded by the joint efforts of the battery makers and vehicle makers to try out electrics *versus* petrol vehicles. They ordered a reasonable number for a test, and the result was that the trials did not, in the opinion of the G.P.O., justify further orders being given. This was not due to any failure of or dissatisfaction with the batteries. I know a case in which an electric vehicle was submitted for test against petrol, and it was found on delivery that it did not even comply with the police regulations in force with regard to brakes.

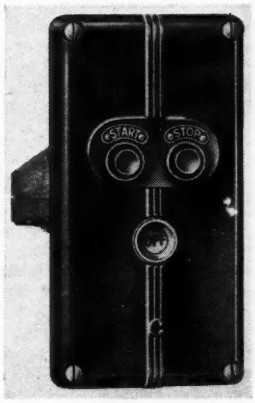
No, it won't do. We battery makers refuse to carry the baby. I admit that matters recently have somewhat improved. The market is still there and more than ever now, but unless someone with experience in the manufacture and marketing of motor cars on a large scale and with sufficient finance to do so comes forward, I am afraid that progress will continue to be slow. There is, however, no occasion to wait for Mr. Wilson's radio-active material, either synthetic or otherwise. They have not done so on the Continent.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Flush Mounting Control Panel

AN addition to the range of automatic protective control gear offered by J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall, is a flush mounting control panel consisting of a direct-on-line, automatic, triple-pole air-break switch suitable for use on 400-V supplies up to 4 A. A compensated thermal overload-release is fitted in each of the three phases and no-volt protection is inherent. The switch is mounted behind an attractively designed cast front plate measuring 5 in. by 9¼ in. The "start" and "stop" push-buttons and the observation window, designed to provide visual "on" and "off" indication, are neatly grouped in the centre.



Crabtree flush mounting control panel

The panel was originally designed for the built-in control of the "Milford" double-ended electric grinding machine distributed in this country by B. Elliott & Co., Ltd. It will, however, be of considerable interest to all who are concerned in the design of machine-tools, since the size and fixing centres of the front plate can be varied to conform with the requirements of most machines. It is pointed out though that wherever this particular plate can be employed the need for new patterns is avoided and early delivery is assured. In all cases the recess provided to receive the contactor must not be less than 6½ in. high by 4 in. wide by 5½ in. deep.

Renewable Seated Valves

NEWMAN, HENDER & CO., LTD., Woodchester, Glos, inform us that their renewable seated valves can now, in addition to nickel alloy, be supplied with seats and clacks of diamond hard stainless steel (approximately 550/600 Brinell). This metal is sufficiently hard to crush boiler scale, pipe turnings, &c., without damage to the valve seats and clacks.

A.R.P. Hand-lamp

The "Supreme Pilot-lite" produced by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2, in accordance with Home Office regulations for portable hand-lamps normally permits no direct light to be visible above the horizontal, but it can be used to provide general illumination when its hinged reflector is raised, so enabling the light to spread. Even though bedroom windows may not be covered, it is possible to use the lamp without contravening black-out regulations. A 2-V. 20-Ah accumulator with jelly acid to prevent spilling gives 80 to 100 hours light on one charge, and there is a rotary type switch so designed that it cannot be inadvertently switched on or off. The case, which is attractively finished in pillar-box red, has a swing handle.

Street Lighting Fitting

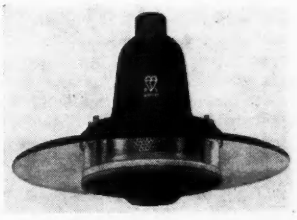
A street lighting fitting made by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4, to conform with BS ARP.37 has been approved by the British Standards Institution for mounting heights of 19 ft. and upwards, at a spacing of not less than 100 ft., when fitted with a 25-W pearl lamp.

Siemens street lighting fitting

The unit consists of a standard 12 in. diameter "R.L.M." reflector, stove enamelled black inside and outside, carrying an annular slotted mask so designed and located as to produce the desired light distribution. The exterior of the mask and the interior of the bottom portion are stove enamelled black; the cylindrical upper portion is stove enamelled white inside. Access for cleaning and relamping is provided by the removal of the bottom cup portion of the mask, it being necessary only to slacken the holding screws. As the detaching of this cup does not entail the complete removal of any nut or stud, there is no danger of the loss of these fixings.

The reflector is flashed to a depth of approximately 2¼ in. from its lip while a reasonably broad ring of light is emitted from the slot in the mask. As a result the fitting appears to emit more light than is actually the case.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, has also received B.S.I. sanction for a street-lighting fitting. It is neatly constructed with a light cast canopy and bottom disc, while the body is a single pressing. Two brass thumb-screws permit easy lamp replacement. In view of the small amount of light permitted, it is important that the fitting shall not deteriorate in use. Accordingly, dust and small insects are prevented from clogging the fine mesh inside by means of a small glass cylinder held between two rubber sponge gaskets.

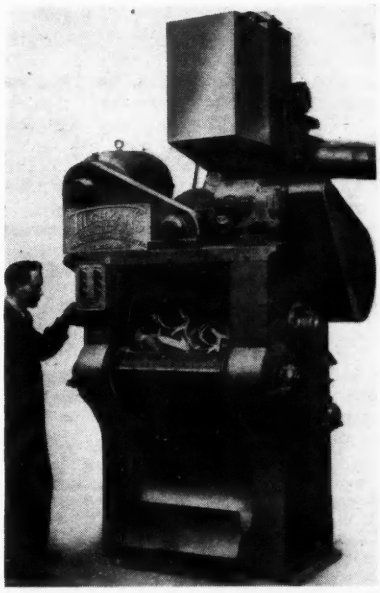


Metrovick street lighting unit

Samples of all fittings manufactured are inspected at the factory to ensure not only that they fall within the limits allowed by BS/ARP37 but also that the light distribution in all directions approaches the maximum allowed. Electrical and mechanical adaptors of all types are available, and weather-proof cast canopies drilled and tapped for conduit entry can also be supplied.

Abrasion Cleaning

An addition to the range of "Wheelabrator" units developed by TILGHMANS PATENT SANDBLAST CO., LTD., Broadheath, Manchester, is the "Baby Tumblast." This is made in various sizes for which Crompton Parkinson "Klosd" motors of from 5 to 15 HP are used for the main "V" drive and 2- and 1-HP geared motors of the same type for the conveyor and the elevator. The contactor push-button control gear includes provision for plugging the wheel to bring it to rest quickly for rapid recharge of castings. With most types an electrically operated loader is employed with a capacity equal to one charge of the unit which is driven by a worm-geared 1½-HP motor with automatic limit reversing control.



"Baby" Tilghman "Wheelabrator"

In the "Wheelabrator" system the abrasive is thrown from a rapidly revolving wheel, centrifugal force imparting the requisite high velocity, which is claimed to absorb considerably less power than is needed with compressed air.

Emergency Lighting Equipment

Referring to its model "A.C.4/3" emergency lighting equipment described in the ELECTRICAL REVIEW last week (page 221) the LAWLEY ELECTRIC STORAGE CO. points out that the unit is designed to light a number of 24-V lamps, not one as stated. The accumulator employed, made by the Varley Dry Accumulator Co., contains no free or jelly acid.

Parliamentary News

By OUR SPECIAL REPORTER

Coal Distribution

IN the House of Commons last week Mr. Greenwood asked the Minister of Transport what steps he was taking to increase the tonnage of coal carried on the railways in order to meet the needs of public utility undertakings and other consumers.

In the course of his reply Captain Wallace said that the general interest required that the needs of the public utility undertakings (electricity, gas and water) should be met as well as the domestic supply, and it had been decided, after a careful review of the coal situation generally, that special measures must be taken to augment the supplies of coal to such undertakings, especially those in London and the South of England. This would involve the drawing of additional supplies of coal by rail from the Northumberland and Durham areas as well as from the Midland Amalgamated District, which included South Yorkshire.

He had accordingly asked the Railway Executive Committee to make such arrangements as would enable an increase of some 70,000 tons of coal per week to be carried in train loads from collieries in these areas direct to London and the South.

Electricity in Rural Areas

Mr. De la Bère asked the Minister of Transport whether he would take steps to secure the necessary statutory powers to enable his department to compel undertakers to supply electricity to rural areas where a supply would enable such areas to obtain an increased output from their farms with a view to securing maximum production.

Captain Wallace said that where supplies of electricity were required in rural areas for work of national importance such as increasing agricultural production and could be provided on a reasonably economic basis, he had no reason to suppose that the electricity undertakers would not be prepared to afford them.

L.P.T.B. Finance

Mr. Ridley asked the Secretary to the Treasury what was the amount loaned to each of the undertakings concerned under the London Passenger Transport (Agreement) Act, 1935; at what rate of interest; and what amounts, if any, had been repaid.

Captain Crookshank said that the amount raised by the London Electric Transport Finance Corporation, Ltd., under the London Passenger Transport (Agreement) Act, 1935, was £39,966,250 by the issue of 2½ per cent. guaranteed debenture stock, 1950/55, viz.:—£32,000,000 stock at 97 per cent. and £9,650,000 stock at 92½ per cent. The approximate rate to the Corporation (allowing for redemption at par in 1955) on the larger issue was £2 13s. 11d. per cent. and on the smaller issue £3 0s. 8d. per cent.

Under the agreement between the Finance Corporation and the transport undertakers the sum raised was available to the Transport undertakers (at the same rates) in the following proportions:—London Passenger Transport Board, 70 per cent. (£27,976,375); Great Western Railway, 5 per cent. (£1,998,312); London & North Eastern Railway, 25 per cent. (£9.991,563). The expenses of management of the Corporation were borne by the transport undertakers in the same proportions. No amounts had been repaid; the stock was not finally repayable until August 1st, 1955, but it might be repaid on or after August 1st, 1950.

I.E.E. Regulations Amended

A SUPPLEMENT to the eleventh edition (1939) of the Regulations for the Electrical Equipment of Buildings has been issued (under date February 22nd) by the Institution of Electrical Engineers, from which copies may be obtained free of charge.

The definition "Non-Ignitable (Incombustible)" now mentions B.S.S. 738. The latter supersedes B.S.S. 476 and 478 in the definition "Self-Extinguishing," in which the reference to the margin of 5 sec. of burning after removal of the source of heat has been cut out.

There is a new clause (C) in Regulation 701 to cover non-luminous tubular or panel heaters in which the element cannot be touched. These can now be controlled by a switch in the final sub-circuit, which in a dwelling must be in the same room. The use of a pilot lamp does not make such appliances subject to the requirements of clause (B). An alteration in the latter provides that while the switch must be in the same room as a fixed heating appliance, other than those provided for in (C), it shall "preferably" be (not "must be" as hitherto) within easy reach. The previous clauses (C) and (D) have been appropriately relettered.

By a modification in 803 (B), a separate primary final sub-circuit is to be provided where the aggregate "input" (instead of "input rating") of each group of transformers of a fixed luminous discharge-tube installation does not exceed 1,000 VA. An alteration in 810 (A) makes it clear that the ban on the general installation of high-voltage cables in the metal conduit applies only to those of the unarmoured type.

Two clauses, (D) and (E), have been added to Regulation 1311, stipulating that the area of the earth-continuity conductor in a flexible cord shall be the same as that of each of the main conductors when these are 0.0048 sq. in. or less. For larger flexible cords and for flexible cables, the area of the earth-continuity conductor shall not be less than half that of a main conductor, with a minimum of 0.0048 sq. in. Minor corrections have been made in the definition of "Switch, Single Pole," and in Regulation 1301.

Electrical Supervisors' Dinner

NOTWITHSTANDING the black-out and the influenza epidemic, the latter making notable gaps in the ranks of those who had intimated their intention to be present, the attendance at the dinner of the Association of Supervising Electrical Engineers at the Connaught Rooms, W.C.2, last Saturday exceeded three hundred.

The chair was taken by Mr. H. W. Swann (president of the Association), and the usual toast of "The Electrical Industry" was proposed by Mr. F. Gill (a past-president of both the A.S.E.E. and the I.E.E.), who referred to the universality of electricity, whether in heavy- or light-current applications, from large hydrogen-cooled alternators or the propulsion plant of the *s.s. Normandie* to signalling systems, in all of which it had proved to be Trusty Servant No. 1. To the younger men he said that the quality employers looked for first of all was reliability.

Responding, Sir Noel Ashbridge (vice-president, I.E.E.) said that while war could only be regarded as a disaster, it did provide opportunities for engineers of all kinds. Many of the achievements in improvisation would become known only after the end of the war. In broadcasting the aim had been to give a service comparable with that before September without helping the enemy, and some of the problems involved which had seemed almost insoluble were being got over. The B.B.C. was now broadcasting in eighteen foreign languages.

Sir Noel commended the work of the Association in regard to national registration and also its liaison with the I.E.E. over the Wiring Regulations. (The Employee's Guide to the latter will soon be ready, we believe.)

The President, proposing the health of the guests, quoted Professor Oliphant's view that wireless would be a fundamental controlling factor in the war, and said that a mechanised war would require the services of all available technicians. The Association had decided early in the present session to carry on and hold its meetings, and other similar bodies had now followed its example. The subscriptions of members serving in the Forces had been suspended, and copies of the Association's journal and other notices were being sent them. With a view to meeting higher costs of living and compensating for more onerous duties, employers had been asked by the Executive Council to increase the salaries of the supervisory grades by 15 per cent., and were responding favourably.

Replying for the guests, Mr. Asa Binns (president, I.Mech.E.) quoted examples from published figures to show that this was an engineers' war. The remarkable freedom from breakdown of plant in the Navy in spite of overdue overhauls was a case in point. There was no doubt, he said, that British aircraft was more than equal to that of the enemy.

Electroformed Metal Screens

THE building up of metal screens solely by electro-deposition without woven or other supporting structure is referred to in the *Nickel Bulletin* for February.

This new material, which resembles perforated metal, is known as "Lektromesh" and is claimed to combine accuracy of hole diameter with smoothness of surface. The number of holes can be varied from 16 to 50 per cent. of the total area, which is comparable with woven mesh. The required design is transferred by a succession of sensitising, etching, filling and surface-treating processes to a metal plate or matrix, which is fastened to a cylinder revolving in the plating bath.

After the exposed areas have been built up the finished mesh is stripped automatically from the matrix. The material can be drawn, stamped, welded and soldered; it is tough, stiff and strong.

COMMERCIAL and INDUSTRIAL NEWS

Export Trade Development. Large Transformers for the Central Board. New Daylight Lamps. Bell Foundry Lighting. Employment in January

Developing Our Export Trade

SPEAKING in Glasgow on Monday last Mr. R. S. Hudson, Secretary of the Department of Overseas Trade, said that the nation's export trade needed industry and organisation. If we were to increase our exports on anything like the scale necessary, clearly a much larger quantity of raw materials was required than in peace-time, and we must restrict home consumption. This might hamper the manufacturer who ordinarily catered for the home market. The question of price might become dominant. Many of our most important industrial competitors were neutral, and did not have to bear the financial burdens of a nation at war. High freight rates and war risk insurance increased the cost both of our raw materials and of the goods made from them for sale abroad. Goodwill would not suffice to sell our goods if our costs and prices rose much further. The industrialist and the workman would each have to play his part. The Government had already conducted negotiations with a number of industries. The necessary allocation of raw materials had been made, and those industries were now actively planning and in some cases already carrying out, their programmes of increased exports.

I.M.E.A. Annual Meeting

The Incorporated Municipal Electrical Association is holding its ordinary general meeting in London on May 30th. There will be no Convention this year.

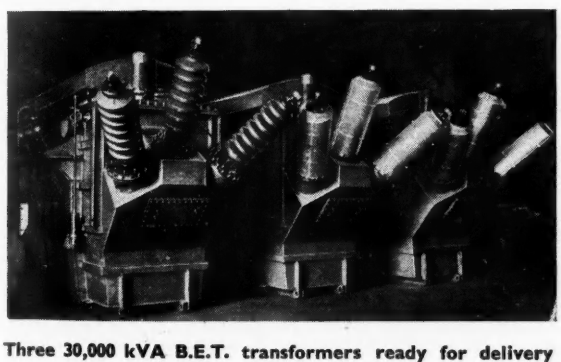
Register of Surplus Plant

The re-organisation of industry on a wartime basis and the consequent difficulties sometimes experienced in obtaining immediate delivery of new plant or in disposing of surplus equipment reminds us of a useful service rendered by the British Central Electrical Co., Ltd., 6-8, Rosebery Avenue, London, E.C.1. This is the keeping of a record of surplus plant held by its wide circle of customers. Mr. E. S. Conradi, the managing director, tells us that the extensiveness of the list usually makes it possible to meet requirements at short notice, while the arrangement has the additional advantage that prospective purchasers can often have the opportunity of seeing the plant in operation before buying it. The company claims to be able to meet out-of-the-way demands and operates a complete technical advisory service.

Transformers for the C.E.B.

Five large-type "OFB" transformers have been supplied by the British Electric Transformer Co., Ltd., for the Central Electricity Board. They are three-phase, 50-cycle units with a capacity of 30,000 kVA, and their no-load ratio is 132,000/33,000 V, star/delta connected.

The transformers, which are designed in accordance with BSS171/1936, are of the five-limb core type. On the h.v. windings tappings are provided for ±2.86 per cent. and



Three 30,000 kVA B.E.T. transformers ready for delivery to the Central Electricity Board

±7.15 per cent. voltage variation, and they are connected to a five-position off-circuit linear-type tapping switch which can be operated conveniently from ground level.

There are two air-blast coolers which have forced oil circulation and are bolted direct to one end of the main tank. Each transformer is fitted with explosion vent and silica-gel-type breather, while in addition dial-type thermometers and window-pattern oil gauges are standard. On both the high- and low-voltage sides the bushings are of the compound-filled condenser type. Above each main tank cover auxiliary three-phase transformers are mounted in small tanks. These are permanently connected to the low-voltage side of the main transformers. They are rated at 30 kVA with a no-load ratio of 33,000/400 V, delta/star connected, and are of the "ON" type. On these transformers there are no tappings.

New Daylight Lamps

A new 80 W 200-250 V "Mazda" fluorescent lamp has been developed by the British Thomson-Houston Co., Ltd., which provides daylight quality at high levels of illumination efficiently and at reasonable cost, and without discomfort from heat. The lamp is a slender 5 ft. glass tube and light is produced through the agency of invisible radiation acting on fluorescent powder on the inside of the tube. The lighting from the lamp is a close approximation to north sky daylight, and it has a low surface brightness—about 6 candles per sq. inch—which gives perfect diffusion with absence of shadows. The lamp has an efficiency of 35 lumens per watt, which is approximately three times that of a gasfilled lamp and five times that of a gasfilled lamp with daylight bulb. A similar lamp has been added to the "Osira" range of the General Electric Co., Ltd.

There are many applications for these lamps in the sphere of modern lighting, both as an illuminating and as a decorative unit. Among their varied uses are industrial illumination, such as local lighting of benches and machines, and lighting for commercial colour matching and drawing offices.

Small assembly bench illuminated by the new "Mazda" fluorescent lamps

They are also suitable for commercial lighting where standardised designs of fixtures of a more decorative character can be generally used.

The B.T.H. Company has designed a special "Mazdalux" industrial reflector for use with its new lamp. This is of sheet steel and is supplied complete with fixing clips for the lamp and with suspension fittings. The control unit and the power factor correction condenser are enclosed within a box mounted on the top of the reflector and are supplied ready for use. The reflector is finished in white inside and green outside with a special durable paint.

A special trough reflector has also been designed by the G.E.C. for use with its new lamp. This has provision for two-way tube suspension or four-way chain suspension and is simple, rigid and accessible.

Electrodepositors' Technical Society

The annual general meeting of the Electrodepositors' Technical Society was held in London recently, Dr. H. J. T. Ellingham, president of the Society, being in the chair. Dr. S. Wernick, in presenting the hon. secretary's report, referred to the advantages which had resulted from the recent centralisation of the Society's administration at the Northampton Polytechnic. He mentioned, however, that for the first time for many years there had been some falling off in the number of members, a situation which he hoped would be remedied during the ensuing year. The normal annual number of meetings, ten in London and nine in Birmingham, had been held during the year, and the total number of papers presented at the meetings was twenty. Dr. Ellingham gave his presidential address, his subject being "The Metals."

French Electrical Contractors and the War

To place the mutual assistance arrangements of the French Electrical Contractors' Syndicate on a legal basis a blank contract has been drawn up by the National Syndicate for signature by members under which they undertake to respect certain rules of conduct, and to assist each other when necessary. The agreement provides that any contractor who is in difficulties of any sort shall notify the Syndicate. He is to keep it informed of any obstacles in the way of the execution of contracts or of any contracts which he is obliged to refuse. The Syndicate will then examine the question and see what measures can be taken to overcome the difficulties

and "to re-establish in whole or in part the activity of the contractor who may be threatened." Each contractor undertakes, moreover, not to engage any of the staff of any other contractor, without there being a special agreement between the two firms, and not to do anything which may attract the customers of any other contractor who may be mobilised or in any difficulty. If the firm which cannot execute its contracts agrees, such contracts may be carried out by the other members of the Syndicate, under joint control. The other members must not take advantage of the situation to try to attract to themselves further business of the same customer. Any disagreements will be settled by arbitration and any violation of the agreement will be punishable by exclusion from the Syndicate. It is pointed out that this contract carries no limit as to time or conditions. It is, therefore, to continue to be valid after the war.

Met.-Vick. electric-discharge lighting in a bell foundry

G.E.C. and Export Trade

The maintenance of British export trade during wartime is of vital importance if we are to retain our hold on foreign markets. Although many electrical concerns are engaged on work of national importance they are not losing sight of the importance of their export trade. When war broke out the G.E.C. already had thirty-six branches, mainly in the British Empire, and an adequate agency representation in all the principal markets of the world. The policy of this overseas organisation is controlled by Mr. L. C. Gamage, the company's export director. On September 4th the G.E.C. export and distribution plan was put into operation. The most important part of the general problem was the apportioning of the total production of the company's factories in such a way that Government orders for material required at home could be fulfilled with the greatest possible speed. Production was increased in all directions, and after Government orders had been executed a specified percentage of production was allocated to export requirements, and exports were scheduled to be at least as great as those for the preceding twelve months. Already, we are informed, there are indications that this figure will be exceeded by a large margin. A world-wide advertising campaign was put into operation, based on the phrase "Export Trade Comes First," and concurrently with this a similar statement was circulated by post to customers in almost every country in the world. These efforts have already produced very encouraging results.

Met-Vick. Employees' National Savings

A scheme to encourage and facilitate the purchase of National Savings Certificates by their employees, has been instituted by Metropolitan-Vickers Electrical Co., Ltd., in order to assist the war finance campaign. The scheme provides arrangements whereby regular weekly or monthly contributions which employees are willing to subscribe are deducted from wages and salaries and used to purchase certificates in the names of the contributors. As the total sums contributed each week will be invested immediately, each certificate delivered to a contributor will bear a date earlier than that of his final payment for it. As an additional attraction, the company will itself purchase a number of gift certificates, which will be distributed among members of the scheme in a half-yearly ballot. As the total number of employees is about 19,000 the scheme should make a very substantial contribution to the national effort.

Light-locks

The B.S. Specification for light-locks for shop entrances issued last September has been revised and considerably extended to apply to entrances to all kinds of buildings, e.g., shops, blocks of flats, factories, garages, &c. Fourteen diagrams are included, showing the general principles and typical examples not only for pedestrians but also for lorries, vans, private cars and hand-barrows. The specification is therefore of direct interest to owners and occupiers of almost all types of buildings. Copies can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 8d.

Discharge Lighting in a Bell Foundry

A short time before the outbreak of war Metropolitan-Vickers illuminating engineers, in conjunction with Mr. J. H. Hickling, electrical contractor, Loughborough, were responsible for a mercury-discharge installation at the works of John Taylor & Co., bell founders, Loughborough. This firm has been responsible for some of the most famous bells and carillons in the world, its work including the casting in 1881 of the 17-ton "Great Paul" which hangs in the south-west tower of St. Paul's Cathedral, "Great Peter" (10½ tons) for York Minster, cast in 1927, and "Little John" (10½ tons) for Nottingham, cast in 1928. A carillon of seventy-two bells was commissioned for Mountain Lake bird sanctuary, Florida, U.S.A., in 1928, the largest bell of the set weighing 11 tons. The new lighting installation had to allow for the disposition of the work in the buildings so that a symmetrical layout would have been uneconomical. Despite this the illumination has a minimum value as high as 8 ft.-candles.

Employment in January

The numbers of unemployed in the engineering industry as a whole showed little change in January, according to the *Ministry of Labour Gazette*, but in general, electrical and constructional engineering there was a slight increase. The percentage unemployed among insured persons in the engineering industry as a whole (excluding motor vehicle, cycle, and aircraft manufacture) was 3.3 at January 15th, as compared with 3.2 per cent. at December 11th, 1939, and 8.5 per cent. at January 16th, 1939.

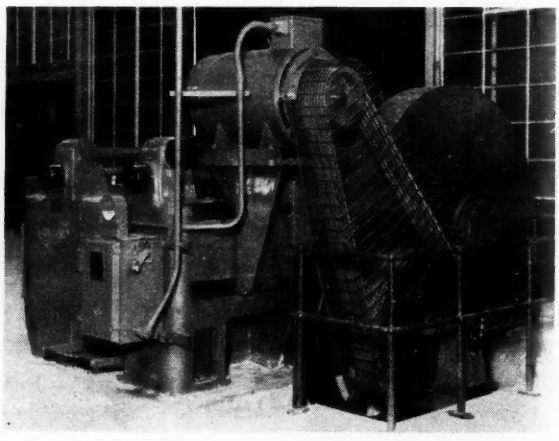
In electrical engineering the number out of work on January 15th was 3,124, or 2.5 per cent., as compared with 2.4 per cent. in the previous month, but a decrease of 3.2 per cent. as compared with January last year. In the electric wiring and contracting industry the unemployed totalled 3,508, or 8.2 per cent., as compared with 7.4 per cent. in December, and 12 per cent. in January, 1939. The unemployed in the electric cable, apparatus, lamp, &c., group amounted to 9,198, the percentage rising by 0.3 to 5 (7.7 per cent. in January, 1939).

Minister of Food at E.A.W. Lunch

Mr. W. S. Morrison, Minister of Food, is to be the principal guest and speaker at the luncheon which the Electrical Association for Women is to hold at the Park Lane Hotel, London, on April 18th.

"Low-current" Motor Application

The accompanying illustration of a "Covmac" No. 6 forging machine is an example of the type of drive for which the L.S.E. "low-current" high torque motor is claimed to be especially suitable. The starting conditions are severe, against twice full-load torque and the acceleration of a heavy flywheel load. Tests made with a high-torque motor of conventional design and auto-transformer starter with 75 per cent. tapping showed a starting current of 7.3 of the full-load value, while a slip-ring motor's accelerating period was 89 seconds. By contrast a 35-HP, 980-RPM "Emcol" totally enclosed "low-current" high-torque motor was designed to accelerate the load in about 40 sec. The starting current was 2.46 f.l.c. in star (about one-third of that of an ordinary high-torque motor) and its accelerating period in star was 30 sec. (about one-third of that of a slip-ring motor).



"Covmac" forging machine driven by a 35-HP, 980 RPM "Emcol" high-torque, low-current squirrel-cage motor

A New Kettle Cutout

To help dealers to make quick sales of the new G.E.C. streamline kettle, a special cardboard cutout display in white, black and green is being distributed by the company's display organisation. This, as shown in the accompanying illustration, forms an attractive background to the kettle, and sets off its unconventional but pleasing lines.

A cut-out for the new G.E.C. streamline kettle

Design and Welding

Although the soundness of an electric weld depends so much on the skill of the operator, the designer can assist to a very marked degree. A draughtsman who is able to express his designs in terms of the more standard joints with which the operator will be familiar can avoid placing before the welder structures which are difficult to handle, have poor accessibility, and possess unbalanced thermal capacities. Of assistance in this connection is a 35-page illustrated booklet prepared by Mr. I. H. Child with the aid of the data library and research records of the British Thomson-Houston Co., Ltd. It is entitled "Principles of Electric Arc Welding" (Draughtsman Publishing Co., Ltd., 1, Links Road, Epsom, Surrey) being an addition to the series of technical publications sponsored by the Association of Engineering and Shipbuilding Draughtsmen.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price February 28th	Fortnight's inc. or dec.
a Acid oxalic ... ... per cwt.	Suspended	—
a Ammoniac, Sal ... ... per ton		—
a Ammonia, Muriate (large crystal)... ,,		—
a Borax... ... ... ,,		—
a Copper, Sulphate ... ... ,,		—
a Potash Chlorate ... ... per lb.		—
a ,, Perchlorate ... ... ,,		—
a Shellac ... ... per cwt.		—
a Sulphur, Commercial ... ... per ton		—
a ,, Roll ... ... ,,		—
a Soda, Chlorate ... ... per lb.		—
a ,, Crystals ... ... per ton		—
a Sodium Bichromate, casks ... per lb.		—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£110	—
b ,, Wire ... ... per lb.	1/3 to 1/9	—
b ,, Sheet and Foil ... ,,	1/6 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	9¼d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	1/1½ to 1/1¾	¼d. inc.
c ,, Wire, basis ... ... ,,	10¼d.	¼d. inc.
c Copper Tubes (solid drawn) ... ,,	1/2¾	¼d. inc.
g ,, Bars (best selected) ... per ton	£95	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£62	—
d ,, ,, Wire Rods ... ,,	£65.10s.	—
d ,, ,, H.C. Wire ... per lb.	9 5/8d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10to2/3 + 20%	—
f ,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8 adv.	—
n German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Parafine ... ... ,,	1/0¾	¼d. dec.
g Lead, English Pig ... ... ,,	£26.10s.	—
g Mercury ... ... per bot.	$207	—
e Mica (in original cases) small ... per lb.	1/3 to 3/–	—
e ,, ,, ,, medium ... ,,	9/– to 18/–	—
e ,, ,, ,, large ... ,,	20/– to 27/6	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1 3¾	¼d. inc.
p ,, ,, rolled strip & sheet ,,	1/1¾	¼d. inc.
p ,, ,, wire ... ... ,,	1/3¼	¼d. inc.
o Platinum ... ... per oz.	£10	—
d Silicum Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£25.15s.	—
g Tin, Block (English) ... ... ,,	£254.15s.	£12.10s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works, Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

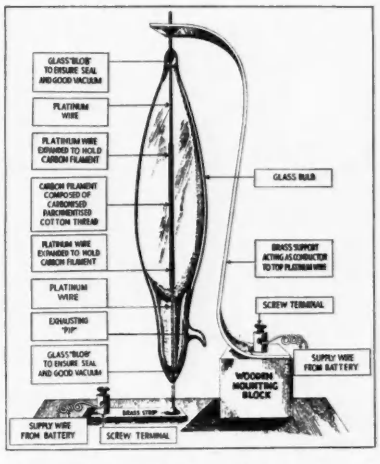
Trade Announcements

Bakelite, Ltd., has acquired the works and business of Warerite, Ltd., of Ware, Herts, which has been engaged in the manufacture of synthetic resin laminated sheet materials.

Vactric, Ltd., has reopened its showroom at 149, Regent Street, London, W.1.

The First Incandescent Electric Lamp

Such interest has been aroused by the Edison Swan Electric Co.'s museum of electric lamps at its showrooms at 155, Charing Cross Road, W.C.2, that in response to many requests a poster has been prepared indicating the construction of the first practical incandescent electric lamp made by Sir Joseph Wilson Swan and exhibited at Newcastle in 1878. The poster is intended primarily for the use of science masters in technical colleges, &c., but copies are also available for any other interested persons.


GLASS "BLOB" TO ENSURE SEAL AND GOOD VACUUM
PLATINUM WIRE
PLATINUM WIRE EXPANDED TO HOLD CARBON FILAMENT
CARBON FILAMENT COMPOSED OF CARBONISED PARCHMENTISED COTTON THREAD
PLATINUM WIRE EXPANDED TO HOLD CARBON FILAMENT
PLATINUM WIRE
EXHAUSTING "PIP"
GLASS "BLOB" TO ENSURE SEAL AND GOOD VACUUM
GLASS BULB
BRASS SUPPORT ACTING AS CONDUCTOR TO TOP PLATINUM WIRE
SCREW TERMINAL
SUPPLY WIRE FROM BATTERY
WOODEN MOUNTING BLOCK
BRASS STRIP
SUPPLY WIRE FROM BATTERY
SCREW TERMINAL

The first practical incandescent electric lamp

Large Store Installation

In the article under the above heading in our February 9th issue, describing the electrical installation at the new building of the Birmingham Co-operative Society, Ltd., we inadvertently omitted to mention that the architects of the building were the C.W.S. Architects' Department, Manchester.

New Catalogues and Lists

Santon, Ltd., Somerton Works, Newport, Mon.—A leaflet relating to new immersion heaters specially produced for use in domestic water cisterns to prevent freezing-up.

Rotherham & Sons, Ltd., Coventry.—A folder describing the various types of pumps manufactured and also the facilities available for meeting customers' special requirements.

Metropolitan Electric Supplies, Metway Works, 2, Marshalls Row, Brighton.—An illustrated price list of "Metway" electrical accessories.

Industrial Controls, Ltd., North Road, Southall, Middlesex.—A catalogue of "Industrial" flow meters.

Lincoln Electric Co., Ltd., Welwyn Garden City.—The first of a series of bulletins pointing out the advantages of "Fleetweld" electrodes.

Marconiphone Co., Ltd., Hayes, Middlesex.—Literature relating to a new all-dry battery portable model "891" radio receiver.

Gramophone Co., Ltd., Hayes, Middlesex.—Details of a new all-dry battery portable model "1403" radio receiver.

Crypton Equipment, Ltd., North Acton Road, Park Royal, London, N.W.10.—An illustrated leaflet giving particulars of a new non-mercurial automatic battery cut-in and cut-out.

W. T. Henley's Telegraph Works Co., Ltd., Milton Court, Westcott, Dorking.—A folder describing a new universal clamp connector.

Brush Electrical Engineering Co., Ltd., Loughborough.—Various leaflets relating to recent developments in switchgear design.

Rawlplug Co., Ltd.—A folder giving details of a new electric hammer.

E. K. Cole, Ltd., Southend-on-Sea.—The latest issue of "Thermovent News" emphasises that the capital cost of a new and efficient heating system can soon be recouped by lessened running costs.

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—A window bill illustrating the "Atlas" 5-8 watt lamp. Also a circular letter drawing dealers' attention to the advantages of stocking these lamps.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

MAXIVEE batteries.
KANGAROO fire.
GLOW-IN-COAL fire.

ELECTRICITY SUPPLY

Barnstaple Inquiry Result. London Electrical Engineers' Mutual Assistance Plan. Northmet Charges Increased. "One Light, One Plug Point" Installations at Middlesbrough

Barnstaple.—PLANT EXTENSION APPLICATION REJECTED.—The Town Council has been notified by the Electricity Commissioners that its recent application for consent to borrow £12,655, to extend the Council's generating station, cannot be granted. When an inquiry was conducted recently into the application it was stressed that the estimated maximum demand for the current year would be up to the present capacity of the generating plant (1,770 kW).

Bedford.—COAL STACKING PLANT.—The Town Council has approved a scheme for installing coal stacking and reclaiming plant at the power station at estimated cost of £8,500.

Bexhill.—PROPOSED PRICE INCREASE.—The Electricity Committee reports that the year's loss is likely to be £7,206, and it is suggested that charges should be increased by 15 per cent.

Chester.—SEWAGE WORKS PLANT.—The Improvements Committee is to replace electrical equipment at the Sealand sewage works at a cost of £873.

Cleethorpes.—INCREASE IN CHARGES.—Owing to an estimated loss on the current year's working and increased expenditure next year, charges are to be raised after April 1st.

Cornwall.—PROPOSED JOINT COMMITTEE.—An indirect result of the opposition of Cornish authorities to the proposed Bill of the Cornwall Electric Power Co. is a recommendation that a standing joint committee should be set up to watch the local authorities' and consumers' interests in electricity supply matters in the county. At a conference of the petitioning authorities at Truro it was decided that this recommendation should go before each of the bodies concerned. With regard to the Bill, a satisfactory solution seems to have been reached. The petition is to be withdrawn on an undertaking by the Company to insert a suitable clause safeguarding the interests of consumers.

Croydon.—EXTENSION OF AREA.—The Electricity Commissioners have sanctioned the transfer of the Addington district to the Corporation, which is seeking sanction to a loan of £203,122 for the acquisition.

Doncaster.—SYSTEM INTERCONNECTION.—The Council has submitted to the Electricity Commissioners for approval an agreement with the Yorkshire Electric Power Co. providing for mutual assistance during the war by the interconnection of the systems of the Company and the Corporation.

GRID SUB-STATION.—Subject to Ministry of Health approval, a site is to be leased to the Central Electricity Board for a new grid sub-station.

Clitheroe.—LOAN FOR METERS.—The Electricity Committee is making application to the Electricity Commissioners for sanction to borrow £1,000 for the purchase of electricity meters.

Coventry.—MEETING INCREASED DEMAND.—Owing to the increased demand for electricity, chiefly for industrial purposes, the Electricity Committee recommends an expenditure of £41,000 on transformer installation, and £2,334 on new mains and switchgear.

Egham and Staines.—PUBLIC LIGHTING CONTRACT POSITION.—A joint meeting of the two Councils has been held to discuss their commitments under the public lighting contracts. The Egham and Staines Electricity Co., Ltd., had offered to make an allowance in the contract charges calculated at the rate of ¾d. per kWh on the electricity that would have been supplied since September 1st had no lighting restrictions been in force, but the Staines U.D.C. thought the allowance insufficient. It was decided to obtain information regarding (1) the legal position in view of the compulsory cessation of public lighting in the interests of national defence; and (2) a division of the electric public lighting charges under the contracts as between electrical energy, maintenance of lamps and fittings, &c., and capital charges.

Farnham.—BILL OPPOSED.—At a meeting of the Petersfield Rural District Council recently it was decided to oppose the Bill which has been deposited in Parliament by the Farnham Gas and Electricity Co., and which seeks to authorise the company, among other things, to raise additional capital. A similar step has been taken by the Alton R.D.C. which is lodging a petition against the measure on seven points of principle raised therein and the suspension of the Council's purchase rights of part of the electricity undertaking of the company for 17 years.

Great Yarmouth.—NEON TRAFFIC LIGHTS.—A suggestion by the borough electrical engineer that small neon lamps should be used for lighting traffic refuges and bollards was agreed to by the Emergency Committee recently. The engineer was asked to install 100 such lamps at a cost not exceeding £130.

Hampshire.—ELECTRICITY SUPPLY POLICY.—It is the policy of the County Small Holdings Committee to arrange for electricity supplies to all holdings where circumstances permit and the tenants desire it. The work is done by the Committee and an additional rent, based on the outlay, is charged. Installations on this basis have just been provided to further holdings at Kings Worthy and Titchfield.

Hornsey.—CHARGES TO BE RAISED.—As from the end of May the charges of the Electricity Department are to be increased as follows:—Lighting flat rate, from 4d. to 5d. per kWh; prepayment meters, 4½d. to 6d.; power, domestic and industrial flat rates, 2d. to 2½d.; and all-in domestic rate running charge ½d. to ⅝d., with an increase of 2½ per cent. in the fixed charge.

Hull.—OUTPUT IMPROVES.—In a report to the Electricity Committee last week Mr. D. Bellamy, the general manager, stated that the number of kWh generated during January was 28.0 million compared with 27.6 million in the same month last year. January was the best month since the outbreak of war, especially in regard to the installation of domestic apparatus, 328 new cookers having been installed.

Inverness.—ELECTRICITY QUESTION SETTLED.—Faced with a growing demand for electricity, and having been refused permission to install stand-by plant, the Town Council has ended a nine-year dispute with the Grampian Electricity Supply Co., with whom terms have now finally been agreed for a bulk supply. A clause in the new agreement provides for compensation to be paid should any employees of the Town Council be dismissed through a bulk supply being taken. An umpire is to be appointed by the Commissioners, who will give a decision whether the Grampian Co. or the Town Council is responsible.

Leeds.—ESTIMATED DEFICIT.—It was reported to the City Council at its last meeting that an anticipated surplus on the electricity undertaking had been turned into an estimated loss of £39,270 owing to decreased sales for private and street lighting and other purposes.

Llandudno.—CONWAY VALLEY SCHEME.—The Council is urging the North Wales Power Co. to speed up the construction of a supply line to the coast towns from Dolgarrog, as this would not be subjected so much as present lines to the effects of the weather. The Council wants the Company to proceed with the erection of the proposed 33-kV line along the Conway Valley to the Llandudno, Colwyn Bay and Conway areas.

Liverpool.—LOANS FOR EQUIPMENT.—Application is being made to the Electricity Commissioners by the Corporation for permission to borrow £19,607 for the provision of 48 transformers, required in connection with the change from 6 to 11 kV; and £50,000 for domestic cooking apparatus.

London.—BATTERSEA.—The Electricity Committee has obtained sanction to borrow £3,000 for sub-stations and £12,986 for plant. It is to acquire a site in Battersea Park Road for the erection of a sub-station and provide 35 services at a cost of £254.

CO-OPERATION IN LONDON.—A plan under which the electrical engineers of a number of London local authorities will co-operate in exchanging various forms of help made necessary by air raids is being brought before the Councils concerned. This follows meetings between the electrical engineers of Bethnal Green, Bermondsey, Hackney, Poplar, Shoreditch, Stepney and Stoke Newington.

HIRE-PURCHASE FACILITIES AT HAMMERSMITH.—As from March 1st it is proposed to limit the hire-purchase scheme in general to apparatus not exceeding £6 in value, the instalments to be payable within one year. The granting of applications for the hire purchase of apparatus of a greater value is to be at the discretion of the borough electrical engineer and borough treasurer.

SALE OF SCRAP CABLE.—Finding that if the lead and copper are separated the price obtainable for scrap cable is increased by approximately 30 per cent., the Hammersmith Electricity Department is purchasing a cable-stripping machine.

SOUTHWARK.—An increase of 25 per cent. in electricity charges next June is being recommended to the Council.

FULHAM.—A proposal of the Electricity Committee to install modified street lighting at a cost of £2,120 follows inspection by the Committee of the lighting in Westminster and Wandsworth, which it considered to be very beneficial.

STOKE NEWINGTON.—The Emergency Committee has arranged for the Electricity Department to provide electric cookers at two canteens at a cost of £277.

Macclesfield.—DEVELOPMENT PLANS.—Proposals submitted by Mr. P. Clegg, the new electrical engineer, for the development of the electricity undertaking, recently acquired by the Council, include the extension of mains in a number of districts. A report is to be prepared on the possibility of introducing a new scheme for the sale of appliances on hire-purchase terms. A sub-committee has also been appointed to consider the undertaking's transport arrangements.

Middlesbrough.—COST OF SMALL INSTALLATIONS.—An interesting point was raised at a recent meeting of the Town Council when the borough electrical engineer reported that the Electricity Commissioners had indicated certain types of work which might still proceed. He said that many applica-

tions were being received for services to be laid where the consumers intended installing one light and one plug point only. The capital expenditure involved was about £4 and the revenue very small. He was not sure that the Electricity Commissioners would accept this expenditure. It was decided that the Town Clerk should obtain the Commissioners' views.

North Metropolitan Area.—INCREASE IN CHARGES.—The Northmet Power Co. announces that an increase of 12½ per cent. in its charges will become effective as from the meter readings taken on and after March 1st. This will not apply to supplies to large power users and others who have contracts which provide for an adjustment of electricity charges according to the price of coal. The Company is one of the last of the larger electricity supply authorities in the London area to increase its charges.

Norwich.—DEARER ELECTICITY.—A general increase of approximately 12½ per cent. in existing electricity tariffs was authorised by the City Council last week.

Portland.—INCREASE IN INSTALLATION CHARGES.—In view of the rise in the cost of materials the U.D.C. Electricity Committee has decided to grant a 7½ per cent. increase in payments to wiring contractors. To recover this amount the assisted wiring charges are to be increased by one penny per week.

STABILITY OF SUPPLY.—The electrical engineer recently reported that he had discussed the stability of supply with the Weymouth electrical engineer. The question of a protective network scheme had been gone into and the Metropolitan-Vickers Electrical Co., Ltd., had been asked to tender for this.

SUPPLY TO WORKS.—Terms have been arranged vision of an electricity supply to the new concrete works of the Bath & Portland Stone Firms, Ltd.

Rhyl.—REQUEST FOR SUPPLY EXTENSIONS.—Complaint was made at a recent meeting of the U.D.C. of the town being dependent upon two electricity undertakings for its supply. Rhyl Council is responsible for the main portion and the Electricity Distribution of North Wales and District, Ltd., for the outlying portions. Mr. George Cain, chairman of the Electricity Committee, proposed that the Council should support the householders who had to use candles and oil stoves through the lack of electricity and press the Company to continue negotiations with the property owners with a view to electricity being supplied as soon as possible.

Settle.—ALTERNATIVE SUPPLY REQUEST.—Following two failures of the supply the Parish Council has suggested that the Settle and District Electricity Supply Co., Ltd., should link its mains with those of the Lunesdale Electricity Supply Co. in order to ensure an alternative service when required. The proposal is being put before the Company.

Southend-on-Sea.—ELECTRIC COOKING PROPOSAL.—The Corporation is applying for sanction to a loan of £1,101 for the conversion of the existing gas cookers at the Municipal Hospital, in accordance with an agreement with the County of London Electric Supply Co.

Walsall.—REDUCED STAFF.—When reference was made at the last meeting of the Town Council to the dismissal of about fifteen employees of the Electricity Department, the Mayor said that this was greatly to be regretted, but under present conditions it was impossible to keep all the men on. The proposal for the current year's programme was an indication of the extent to which development had been held up. They were prevented by Treasury restrictions from raising money for anything which was not absolutely necessary. It was stated that the men concerned had between six and fifteen years' service towards pension.

Overseas

Ceylon.—HYDRO-ELECTRIC SCHEME.—It is reported in *The Times* that Major Kotelawala, Minister of Communications, last week inaugurated work on a hydro-electric scheme at Norton Bridge, Watawala. The first stage of the project is expected to be completed in four years, and will have a capacity of 25,000 kW.

Greece.—WATER-POWER DEVELOPMENT.—The granting of a concession to harness one of Greece's principal rivers—the Acheloos—for the generation of electricity was announced recently by General Metaxas, the Prime Minister, states a *Reuter* message from Athens. Three falls are to be created to furnish 820,000,000 kWh annually for the working of metal and chemical projects. The company entrusted with the task is the Société Hellenique Hydroélectrique et Métallurgique, which is associated with the American concerns of Hugh L. Cooper & Co., and the Chemical Construction Corporation. An artificial lake will be built at Cremasta in order to regulate the flow of the river, prevent flooding and develop irrigation works.

Italy.—NEW HYDRO-ELECTRIC PROJECT.—With the title of the Societa Idroelettrica Sarca-Molveno a new company has been formed in Milan to establish and operate a large hydro-electric plant to utilise the water power in the Sarca basin and its tributaries and also that of Lake Molveno

TRACTION

Glasgow.—TRAM-BUILDING ECONOMY PLAN.—A large sum of money will be saved if the Transport Committee agrees to a programme for building four-wheeled trams similar to two constructed at the Coplawhill works as an experiment. The experimental cars cost £2,946 and £3,140 respectively, compared with £4,304 for the specimen Coronation trams built for the Empire Exhibition. A preliminary report last week stated that the new features in the four-wheeled trams included a separate cabin for the driver and improved braking. The trams are four tons lighter than the Coronation cars.

A section of the Electric Vehicle Exhibition held at Manchester last week and described in our February 23rd issue (p. 224)

Maidstone.—EXTENSION OF TROLLEY-BUS SERVICE.—The Transport Committee is applying for an Order for the extension of the trolley-bus service to Barming.

Niagara Development

TWO hundred delegates representing power companies and electrical manufacturers attended the seventh annual winter conference of the Canadian Electrical Association which was held at the Windsor Hotel, Montreal, on January 15th and 16th. The president of the Association, Mr. J. E. Lawson, who is vice-president and general manager of the Canadian Niagara Power Co., delivered a paper on the development of the water power of the Niagara and St. Lawrence Rivers.

Many schemes for the development of electrical power at Niagara Falls were described as "crack-brained" by Mr. Lawson. He stressed that every effort would be made to safeguard the scenic value of the Falls. Engineers claimed that between 40,000 and 80,000 cu. ft. of water per sec. could be withdrawn from the Falls and Upper Rapids without affecting their scenic value, but his estimate was more conservative.

Recalling the disastrous ice jam in January, 1938, which carried away Honeymoon Bridge and flooded the plant of the Ontario Power Co., Mr. Lawson expressed the opinion that the ice problem was the most serious of all. There would have to be a safe margin of water available, he said, to ensure the removal of ice floes and to prevent a disaster to plants from which it would take Ontario many years to recover. Phenomenal winds last winter on Lake Erie, which reversed the flow of the Detroit River and more than halved the volume of water flowing over the Niagara Falls, strikingly demonstrated the need for such a safety margin, he said.

Forgetting scenic beauty but taking account of the ice conditions in the river, he thought that it would be possible for another 30,000 cusecs to be withdrawn from the river above the Upper Rapids and returned below the Falls in the Maid o' the Mist Pool. This, at a head of 220 ft., would develop approximately 600,000 HP. In the event of an acute shortage of power resulting from war needs, approximately 390,000 additional HP, using 30,000 additional cusecs of water, would be available from the present plants at Niagara on both sides of the border. He also advocated the building of submerged weirs and excavations to spread the flow of water more evenly over the American and Canadian falls and—if it did not seriously affect ice conditions—the building of more plant at the foot of the falls. More plant, he considered, could also be built around the rapids above and below the whirlpool.

In a concluding summary Mr. Lawson said that there were the following sources to take care of power needs in Ontario for the next 25 years: St. Lawrence River (international section), 1,000,000 HP; St. Lawrence River (Canadian section) 2,000,000 HP; Nipigon, St. Mary's Ogoki, Ottawa, Abitibi Rivers and other power sites in Ontario, 2,000,000 HP; Whirlpool Rapids development, 300,000 HP; and Niagara development (220 ft. head), 300,000 HP; a total of 5,600,000 HP.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

12128. "Electrochemical treatment of metal." S. J. Blaut and H. M. Lang. April 22nd, 1938. (517415.)

17612. "Electron-discharge devices." Baird Television, Ltd., and C. F. Chapter. June 14th, 1938. (517514.)

18066. "Radio receivers." A. H. Cooper. June 17th, 1938. (517420.)

18838. "Magneto-electric machines." H. E. West. June 24th, 1938. (517614.)

19096. "Electric wave transmission networks or analogous mechanical systems." A. D. Blumlein, H. E. Kallmann and W. S. Percival. June 28th, 1938. (Cognate application 4939/39.) (517516.)

19316. "Röntgen-ray apparatus." H. S. Worrad. June 29th, 1938. (517566.)

19437. "Electrically operated railway or tramway points-shifting mechanism." J. S. Burns. June 30th, 1938. (517518.)

21592. "Fluid-blast electrical circuit-interrupters." British Industrial & Allied Industries Research Association. W. B. Whitney and W. Sumner. July 20th, 1938. (517524.)

21602. "Infra-red and longer wavelength radiating tubes." Telefunken Ges. für Drahtlose Telegraphie. July 23rd, 1937. (516526.)

21718. "Flameproof electric switches." H. Fawcett and Metropolitan-Vickers Electrical Co., Ltd. July 21st, 1938. (517528.)

21888. "Dynamo-electric machines." English Electric Co., Ltd., W. E. M. Ayres, and A. J. Riches. July 23rd, 1938. (Cognate application 8915/39.) (517468.)

21904. "Time-interval indicating and/or recording mechanisms." J. W. Molden, A. B. Webber and Magneta Time Co., Ltd. July 23rd, 1938. (517469.)

21937. "Electrical measuring systems." G. Kent, Ltd., and W. Savage. July 23rd, 1938. (517432.)

22091. "X-ray contrast media." D. J. Branscomben and Imperial Chemical Industries, Ltd. July 25th, 1938. (517425.)

22207. "Electric lamps." British Thomson-Houston Co., Ltd. July 28th, 1937. (517536.)

22263. "Electric hot-plates." G. L. Woolnough and Sun-Vic Controls, Ltd. July 26th, 1938. (Cognate application, 15556/39.) (517538.)

22287. "Luminescent screens in cathode-ray and like electron-discharge tubes." Baird Television, Ltd., A. K. Denisoff and J. M. S. Spiers. July 27th, 1938. (517427.)

22288. "Television or like receivers." Baird Television, Ltd., and L. C. Bentley. July 27th, 1938. (517428.)

22315. "Means for operating electric gas-discharge lamps." J. Lucas, Ltd., J. A. Laird and E. A. Watson. July 27th, 1938. (517430.)

22319. "Electro-magnetic transport device." A. L. Dauphin. March 24th, 1938. (517431.)

22356. "Suction cleaners or other electrically operated portable appliances." Hoover, Ltd. August 6th, 1937. (517437.)

22366. "Electric motor control systems." British Thomson-Houston Co., Ltd. July 30th, 1937. (517438.)

22435. "Electro-magnetic switches or the like." Ericsson Telephones, Ltd., and W. F. R. Taylor. July 28th, 1938. (517572.)

22462. "Electrical resistances." Sangamo Weston, Ltd. (Weston Electrical Instrument Corporation). July 28th, 1938. (517541.)

22477. "High-pressure metal-vapour electric-discharge devices." General Electric Co., Ltd., and J. W. Ryde. July 28th, 1938. (517573.)

22481. "Electric switches with arc extinguishing means." British Thomson-Houston Co., Ltd. July 29th, 1937. (Cognate applications 22482/38, 22483/38, and 22484/38.) (517447.)

22485. "Gas-blast electric switches." British Thomson-Houston Co., Ltd. July 29th, 1937. (517574.)

22486. "Alternating-current generators." British Thomson-Houston Co., Ltd., and T. F. Robinson. July 28th, 1938. (517543.)

22488. "Operating-mechanisms for controllers for refrigerators." Igranic Electric Co., Ltd. August 7th, 1937. (517544.)

22498. "Electric lamp fittings." E. Hirsch. July 28th, 1938. (517450.)

22557. "Electric cells." Nife Batteries, Ltd., and M. Dybeck. July 29th, 1938. (517547.)

22566. "Regulators for dynamos." R. Bosch Ges. July 29th, 1937. (517477.)

22579. "Electric transformers of the liquid immersed type." Hackbridge Electric Construction Co., Ltd., and E. Tobin. July 29th, 1938. (517479.)

22622. "Electron-discharge devices for television and like systems." Baird Television, Ltd., and V. A. Jones. July 29th, 1938. (517482.)

22623. "Television and like receivers." Baird Television, Ltd., and V. A. Jones. July 29th, 1938. (517483.)

22627. "Electrical measuring instruments." Sangamo Weston, Ltd. (Weston Electrical Instrument Corporation). July 29th, 1938. (517484.)

22636. "Electrically operatable indicators." Standard Telephones & Cables, Ltd. (L. J. J. Schreiber and G. X. Lens.) July 29th, 1938. (517485.)

22637. "Instruments for measuring the peak value of electrical impulses. Standard Telephones & Cables, Ltd., D. H. Black, A. S. Grant, and D. H. Macnee. July 29th, 1938. (517486.)

22638. "Answer-back devices associated with printing-telegraph apparatus." Creed & Co., Ltd., and R. D. Salmon. (517487.)

22679. "Electrical compasses for air or other craft." J. T. Shevlin (Siemens Apparate Ind. Maschinen Ges.). July 29th, 1938. (517551.)

22682. "Commutators for dynamo-electric machines." Hoover, Ltd. August 21st, 1937. (517576.)

22683. "Electron beam valves." Marconi's Wireless Telegraph Co., Ltd., and N. Levin. July 29th, 1938. (517577.)

22684. "Thermionic valves." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. July 29th, 1938. (517578.)

22685. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., G. F. Brett, E. G. Herriott, and H. J. S. Gratze. July 29th, 1938. (517579.)

22686. "Radio direction-finding receivers." Marconi's Wireless Telegraph Co., Ltd., and C. S. Cockerell. July 29th, 1938. (517580.)

22687. "Inductances." Marconi's Wireless Telegraph Co., Ltd., N. E. Davis, F. G. Robb, and H. J. Craymer. July 29th, 1938. (517581.)

22732. "Electric sound-reproducing appliances for deaf-aid or for small portable wireless receiving sets." W. E. Harman. July 30th, 1938. (517555.)

22752. "Sparking-plugs." C. M. Carington. July 30th, 1938. (517586.)

22809. "Electric circuit-breaker contacts." General Electric Co., Ltd., P. H. Coales, and C. J. O. Garrard. August 2nd, 1938. (517621.)

22810. "Electric circuit-breakers having arc-control devices." A. Reyrolle & Co., Ltd., and J. A. Harle. August 2nd, 1938. (517622.)

22811. "Electric circuit-breakers of the gas-blast type." A. Reyrolle & Co., Ltd., and J. A. Harle. August 2nd, 1938. (517623.)

22841. "Bearings, particularly for the tuning mechanism for radio-receivers or the like." Standard Telephones & Cables, Ltd., and G. Newton. August 2nd, 1938. (517627.)

22872. "Automatic tuning systems for radio receivers." Marconi's Telegraph Co., Ltd. July 31st, 1937. (517636.)

22902. "Miners' safety lamps." Haitwood & Ackroyd, Ltd., and G. A. Attack. August 3rd, 1938. (517589.)

23076. "Electric-discharge tubes utilising secondary emission." Naamlooze Vennootschap Philips Gloeilampenfabrieken. August 7th, 1937. (517643.)

23086. "Arrangement of circuit-breakers for automatically reconnecting electrical networks." Allmanna Svenska Elektriska Aktiebolaget. August 4th, 1937. (517645.)

23099. "Machines for use in the preparation of the plates for dry or semi-dry cell electric batteries." A. A. Hall. August 4th, 1938. (517647.)

23114. "Electrical wiring systems." R. L. Divison. August 4th, 1937. (517648.)

23125. "Electric condensers." British Insulated Cables, Ltd., F. J. Brislee, J. C. Quayle, and H. B. Chapman. August 4th, 1938. (517649.)

23330. "Deflecting means for use with cathode-ray tubes." Baird Television, Ltd., and G. R. Tingley. August 8th, 1938. (Cognate application 27367/38.) (517597.)

23601. "Distortion-correction in electric wave transmission." Standard Telephones & Cables, Ltd. August 10th, 1937. (517601.)

23607. "Nipkow discs for use in television." General Electric Co., Ltd., and D. C. Espley. August 10th, 1938. (517602.)

23703. "Screens of material adapted to be excited to luminescence by the incidence of charged particles. General Electric Co., Ltd., L. C. Jesty, and J. Sharpe. August 11th, 1938. (517605.)

23706. "Means for suppressing radio-interference by electrical apparatus." General Electric Co., Ltd., and H. C. E. Jacoby. August 11th, 1938. (517606.)

23856. "Scanning devices." Associated Press. February 19th, 1938. (517607.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 21st:—

Osira. No. 609709. Class 2 (IV). Luminous paints.—The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

Aeroflex. No. 606095. Class 9 (IV). Electric fuses, fuse holders, cut-outs, switches, switchgear and parts thereof.—Parmiter, Hope & Sugden, Ltd., Fluvent Electrical Works, Newton Avenue, Longsight, Manchester, 12.

Dictomatic. No. 609904. Class 9 (IV). Telephone instruments and apparatus.—Dictograph Telephones, Ltd., Aurelia Road, Croydon, Surrey.

Mazdaflash. No. 610092. Class 9 (IV). Photographic flash lamps.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

Bentofol. No. 609463. Class 17 (IV). Electrical insulating materials and electric insulators.—Associated Insulation Products, Ltd., General Buildings, Aldwych, London, W.C.2.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Edolite Lamps, Ltd.—Private company. Registered February 13th. Capital, £1,000. Objects: To carry on the business of manufacturers and merchants of electric lamps, fixtures and fittings, wireless apparatus, and fittings, engineers, &c. Permanent directors: A. Bird and Lucy E. Bird, both of 191, Preston New Road, Blackburn. Registered office: 8, Heaton Street, Blackburn.

Modern Electric Power Products, Ltd.—Private company. Registered February 20th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical appliances, apparatus and equipment, electric generators and meters, electric lighting and power sets, advertisement signs, electric fires, cooking stoves, water heaters, &c. Subscribers: N. B. Coop, 48, Ewell Downs Road, Ewell, Surrey, and T. C. Braddock, 128, Reigate Road, Ewell, Surrey. Secretary: T. B. Lane, 190, Glendale Gardens, Leigh-on-Sea. Solicitors: Courtenay Croome & Finch, 3, Lombard Court, E.C.3.

E. W. Merredew & Sons, Ltd.—Private company. Registered February 15th. Capital, £1,000. Objects: To acquire the business of an electrical contractor hitherto carried on by E. W. Merredew at 23, St. James Road, Kingston-on-Thames, Surrey. Directors: E. W. Merredew and E. G. Merredew, both of 65, Elmcroft Drive, Hook, Surbiton, Surrey.

Wireless-Electric, Ltd.—Private company. Registered February 21st. Capital, £1,000. Objects: To carry on the business of importers, exporters and repairers of, agents for and dealers in radio receiving and transmitting sets, and electrical instruments and components, &c. S. C. Coulson, 53, Oakwood Road, Henleaze, Bristol, is first director.

British Neon Power Corporation, Ltd.—Private company. Registered February 13th. Capital, £1,000. Objects: To carry on the business of manufacturers, sellers, importers and exporters of and dealers in advertising signs of all descriptions, refrigerators, wireless, telephone and telegraph apparatus, &c. Permanent directors: A. A. Purrier, 10, Nab Wood Grove, Shipley, Yorks, C. R. G. Purrier, 208, Leeds Road, Fagley, Bradford, and K. M. Moss, "Thornfield," Nicklethwaite, Bingley, Yorks. Registered office: 24, Bank Street, Bradford.

Companies' Returns

Statements of Capital

British Electric Transformer Co., Ltd.—Capital, £1,000,000 in 190,625 5 per cent. cumulative preference and 375,000 ordinary shares of £1 and 1,737,500 ordinary shares of 5s. Return dated December 29th, 1939. 190,625 preference and 400,000 5s. ordinary shares taken up. £266,518 12s. 6d. paid on 176,518§ preference and 360,000 ordinary shares, £24,106 7s. 6d. considered as paid on 14,106§ preference and 40,000 ordinary shares. Mortgages and charges nil.

Elcap, Ltd.—Capital, £700 in £1 shares. Return dated December 31st, 1939 (filed February 8th, 1940). 600 shares taken up. £300 paid, £300 considered as paid. Mortgages and charges nil.

Klovak, Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1939. 2,500 shares taken up. £1,700 paid, £800 considered as paid. Mortgages and charges nil.

Sciaky Electric Welding Machines, Ltd.—Capital, £15,850 in 15,000 preference shares of £1 and 17,000 ordinary shares of 1s. Return dated December 31st, 1939. 8,000 preference and 17,000 ordinary shares taken up. £8,000 paid on the preference shares, £850 considered as paid on the ordinary shares. Mortgages and charges nil.

Electric Supplies & Repairs, Ltd.—Capital, £2,500 in £1 shares. Return dated November 14th, 1939. 2,460 shares taken up. £2,460 paid. Mortgages and charges nil.

Fuller Electrical & Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated November 27th, 1939. Two shares taken up. £2 paid. Mortgages and charges nil.

Adelaide Electric Supply Co., Ltd.—Capital, £3,625,000 in £2,000,000 preference stock, £750,000 preferred ordinary stock, £625,000 ordinary stock and 250,000 5 per cent. "D" preference shares of £1. Return dated November 30th, 1939. All stock and shares taken up. £3,245,000 paid on £2,000,000 preference stock, £750,000 preferred ordinary stock, £370,000 ordinary stock and 250,000 5 per cent. "D" preference shares (10s. per share), £255,000 considered as paid on £255,000 ordinary stock. Mortgages and charges: £1,754,364.

Barlow & Young, Ltd.—Capital, £500 in £1 shares. Return dated December 8th, 1939. 500 shares taken up. £2 paid, £498 considered as paid. Mortgages and charges nil.

Magna Wire & Cable Co., Ltd.—Capital, £11,000 in 10,000 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated December 19th, 1939. 2,027 preference and 11,600 ordinary shares taken up. £2,027 paid on the preference shares, £580 considered as paid on the ordinary shares. Mortgages and charges nil.

John Godden (Stoke), Ltd.—Capital, £2,350 in 1,250 6 per cent. preference and 1,100 ordinary shares of £1. Return dated December 22nd, 1939. All shares taken up. £2,135 paid on 1,250 6 per cent. preference and 885 ordinary shares, £215 considered as paid on 215 ordinary shares. Mortgages and charges: £2,500.

Swedish General Electric, Ltd.—Capital, £100 in £1 shares. Return dated November 7th, 1939. Two shares taken up. £2 paid. Mortgages and charges nil.

Universal Electric Time & Telephone Systems, Ltd.—Capital, £12,000 in 6,000 ordinary and 6,000 6 per cent. cumulative preference shares of £1. Return dated October 31st, 1939. 6,000 ordinary and 5,850 preference shares taken up. £11,850 paid. Mortgages and charges: £10,928 14s. 5d.

Implitico, Ltd.—Capital, £3,000 in £1 shares. Return dated November 1st, 1939. All shares taken up. £3,000 paid. Mortgages and charges nil.

Trix Electrical Co., Ltd.—Capital, £6,000 in £1 shares. Return dated December 18th, 1939. All shares taken up. £2,000 paid, £4,000 considered as paid. Mortgages and charges: £1,500.

Grierson, Ltd.—Capital, £10,000 in 4,000 preference and 6,000 ordinary shares of £1. Return dated December 19th, 1939. 4,001 ordinary shares taken up. £4,001 paid. Mortgages and charges nil.

International Hydro-Electric Development Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated December 26th, 1939. 2,844 shares taken up. £2,844 paid. Mortgages and charges nil.

Electroservice, Ltd.—Capital, £100 in £1 shares. Return dated December 27th, 1939. All shares taken up. £100 paid. Mortgages and charges nil.

E.I.C. Magnetos, Ltd.—Capital, £100 in £1 shares. Return dated December 5th, 1939. Three shares taken up. £3 paid. Mortgages and charges nil.

British N.S.F. Co., Ltd.—Capital, £13,500 in 9,500 ordinary and 3,000 preference shares of £1 and 20,000 deferred shares of 1s. Return dated December 9th, 1939. 9,500 ordinary, 1,100 preference and 20,000 deferred shares taken up. £1,183 6s. 8d. paid (£1 on 1,100 preference and 1d. on 20,000 deferred shares), £9,500 considered as paid on 9,500 ordinary shares. Mortgages and charges nil.

Grays Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 14th, 1939. 1,000 shares taken up. £260 paid, £740 considered as paid. Mortgages and charges nil.

Magnetic Valve Co., Ltd.—Capital, £100 in 2,000 shares of 1s. Return dated December 26th, 1939. 652 shares taken up. £32 12s paid Mortgages and charges nil.

Capital Increases

Woodberry Chillcott & Co., Ltd.—The nominal capital has been increased by the addition of £5,000, in £1 ordinary shares, beyond the registered capital of £5,000.

George H. Scholes & Co., Ltd.—The nominal capital has been increased by the addition of £500, in £1 ordinary shares, beyond the registered capital of £8,000.

Mortgages and Charges

Euston Manufacturing Co., Ltd.—Particulars filed of £500 debentures, authorised January 17th, 1940, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

Stanley Croft, Ltd.—Satisfaction in full on February 9th, 1940, of mortgage dated November 21st, 1935, and registered November 28th, 1935, securing £5,000.

Electrical Development & Securities Trust, Ltd.—Satisfaction in full on December 28th, 1939, of mortgage dated January 27th, 1932, deed dated January 29th, 1935, and deed dated February 6th, 1939, and registered January 28th, 1932, February 1st, 1935, and February 8th, 1939, respectively.

Receivers Appointed

Sign Construction Co., Ltd.—A. H. Partridge, of 3, Warwick Court, Grays Inn, W.C.1, was reappointed receiver by leave of Court on February 10th, 1940, under powers contained in debentures dated May 17th, 1939.

Accumulators "Elite," Ltd.—E. Sproat, C.A., of Union Chambers, Commercial Street, Halifax, was appointed receiver on February 1st, 1940, under powers contained in debenture dated July 29th, 1936.

Company Liquidations

T. W. Ashworth, Ltd., wholesale and retail wireless distributors, 41, Castle Street, Liverpool.—Under the compulsory liquidation of this company the first meetings of creditors and shareholders were held on February 22nd at the Board of Trade Offices, Carey Street, W.C. Mr. J. Barwick Thompson, Senior Official Receiver, reported that the receiver for the debenture holder had realised £96 and the outstanding assets would yield a further £80. There was no likelihood of a surplus resulting for the benefit of the unsecured creditors. The failure of the company was attributed to loss of trade through the war. The liquidation was left in the hands of the Senior Official Receiver.

Sign Construction Co., Ltd., electricians, 77, Grosvenor Road, London, S.W.—The statutory first meetings of creditors and shareholders under the compulsory liquidation of this company were held on February 22nd at the Board of Trade Offices, Carey Street, W.C. Mr. H. P. Naunton, Official Receiver, reported that the company was formed in March, 1926, with an issued cash capital of £1,000, to carry on business as electricians, manufacturers of and dealers in electrical and other advertising signs. Mr. H. S. Coleman, who had controlled the affairs of the company throughout, had stated that he invented a "running news sign" in relation to which he acquired certain contracts which he sold to the company for £250. The trading showed a net profit until 1935. It was conducted by means of loans secured by a debenture of £1,800 and on January 10th, 1940, Mr. A. H. Partridge, C.A., was appointed a receiver for the debenture holder. The lighting restrictions put into effect last August completely prohibited the illumination of signs, with the result that the company's business had virtually disap-

peared. The liabilities were returned at £7,320 against assets £2,212. A resolution was passed for Mr. Roy Mackintyre, C.A., to act as liquidator with a committee of inspection.

Andrew, Son & Ballard, Ltd.—Meeting March 20th at Brook House, Brook Green Road, Hammersmith, W.6, to receive an account of the winding up by the liquidator, Mr. E. T. Rix.

Bankruptcy Proceedings

H. J. C. Luckcuck, 328, Welford Road, Leicester, radio dealer.—The first meeting of creditors was held at the Official Receiver's Office, 1, Berridge Street, Leicester, recently, and according to the statement of affairs filed by debtor there were gross liabilities of £1,238, of which £989 was expected to rank for dividend, with assets estimated to realise £17. The latter was absorbed by the preferential claims, and there was a deficiency of £989. Debtor attributed his failure to the national crisis in September, 1938, restriction of finance facilities on the outbreak of war, and lighting restrictions. The case being a summary one was left in the hands of the Official Receiver as trustee.

F. Durant and **W. Kearns,** lately trading as Durant & Kearns, radio dealers at 68a, Bruce Grove, Tottenham, Middx.—Receiving order made February 19th on debtors' own petition.

B. Adams (Electrical Supply Stores), electrical dealer, 36-37, Merchant Street, Bristol.—Application for discharge to be heard March 15th at the Guildhall, Bristol.

G. E. Holden, radio dealer, 39, Heath Road, Twickenham.—Receiving order made February 10th on debtor's own petition. First meeting March 1st at 29, Russell Square, London, W.C.1. Public examination March 8th at the Court House, Half Acre, Brentford.

J. F. B. Wallen (Auto Radio Co.), radio dealer, 41, Prince George Avenue, Enfield, lately trading at 191, Elgin Terrace, Maida Vale, London.—Discharge suspended for five years until January 16th, 1945.

J. B. Clements, radio and electrical engineer, 85, Church Street, Tewkesbury.—Last day for receiving proofs for dividend March 7th. Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver.

R. Robinson, electrical engineer, The Arcade, Waterfoot, Lancs.—Last day for receiving proofs for dividend March 6th. Trustee, Mr. P. M. Milward, 22, Byrom Street, Manchester, 3, Official Receiver.

B. Harris (Central Radio), wireless dealer, 96, Harwood Road, Fulham, lately trading at 144, Kingsland High Street, E.8.—First and final dividend of 1s. 10½d. in the £, payable at Bankruptcy Buildings, Carey Street, London, W.C.2.

Reports and Dividends

The English Electric Co., Ltd., held its annual meeting on February 22nd when Mr. G. H. Nelson (chairman and managing director), who presided, said that the accounts for the year under review could not give stockholders any indication of what 1940 was likely to produce in view of the uncertainty as to what might have to be faced before the war was brought to an end. The board had, however, through contacts with various companies in Europe, been able to watch the situation developing, and while always hoping that war would never come, they entered into certain arrangements and their new business had actually increased since September. The turnover in 1939 and the carry over to 1940 of orders for their normal products, excluding orders for war material, were both records for the company.

It was important that stockholders should realise the occurrences that might affect their future results. These came under the following main heads:—Delay in supplies, rises in costs, taxation, enemy action, and the sudden cessation of hostilities. The supply of almost all their materials was under the control of the Government, which they believed was making the necessary arrangements to ensure proper deliveries. With regard to rises in costs, the control of price levels in this country was a matter for the Government, and it was beyond the power of the electrical industry, or any other, materially to influence prices.

Present taxation was designed to ensure that the bulk of excess profit over normal pre-war earnings was returned to the Government. It was no doubt the intention when the tax was designed that a proportion of the excess profit should be available to plough back into a business as a protection against future contingencies. In some cases, such as theirs, the basis of collection adopted meant that something more than excess profits arising from war conditions was being taken. Their best standard year under the Finance Acts as they stood at present was the average of the results of 1936-37, which meant that although their trading profit in 1939 was practically the same as 1938, they were liable to very considerable extra taxation. This obviously acted unfairly upon them because the increase of profits in 1937-38 arose from broadening the basis of their business in those and previous years, a policy which did not become fully profitable until several years after the development was carried out. Further, if they were to remain in the front rank of the industry they must have means continuously to conduct and to expand research and development. They hoped, therefore, that the Chancellor of the Exchequer would make the necessary changes in the Finance Acts to amend this position. With regard to the possibility of enemy action, they were in as good a position strategically with their four works as they could hope to be, and if there should be a sudden cessation of hostilities they had orders on their books to provide a nucleus for post-war activities.

Dealing with the company's technical activities, Mr. Nelson said that they had maintained and consolidated their position in all fields of manufacture, both in the home and overseas markets. Orders for a large number of steam turbines, mainly of 30,000-kW, had been received. Two 40,000-kW, 3,000-RPM sets were put into commission during the year, and were the largest 3,000-RPM turbo-alternators in service in this country. The hydro-electric department had in hand a number of water turbines and water-wheel alternators for installation all over the world. Research and experimental work in connection with Diesel engines and Diesel generating plant had seen the introduction of a range of engines with greater power per unit than heretofore. A considerable number of Diesel engines had been completed and were on order for the main-line railway companies. They had received repeat orders from old customers as well as orders from new customers for their Diesel-electric rail cars for overseas railways. A feature of 1939 had been the placing into service of a number of large rolling mill installations, both at home and abroad.

A large volume of work had been carried out by the electric traction section of their organisation, including equipments for British and overseas railways. For the Waterloo and City line they had in course of construction complete coaches as well as the electrical equipments. They continued to receive substantial orders for bodies for motor-buses and trolley-buses. The volume of business in the switchgear and transformer departments continued to be maintained. The short-circuit and impulse testing station was complete, and at present was the best equipped in the world. Considerable business had been secured for mercury arc rectifiers, industrial electric motors, meters and domestic appliances. In support of the policy of the Government they were doing a great deal of export business and were taking their share in maintaining the British hold on various markets. To provide a channel through which the Government could assist with the problems of export business, the electrical industry had set up a committee of directors to deal with the export problems as between the industry and the Government

Lancashire Electric Light & Power Co., Ltd.—Presiding at the annual general meeting on February 22nd Mr. George Balfour, chairman, said that having a large industrial load and a considerable amount of miscellaneous business supplying a revenue which exceeded any deficiency due to the black-out and evacuation, their trading results had not been noticeably affected by prevailing conditions. They could congratulate themselves on having such a diversified class of consumer and on operating in a territory so geographically situated that it had not been necessary to increase their charges.

The number of low-voltage consumers connected, up to the outbreak of war, was on practically the same scale as for the previous three or four years, but since September there had been a considerable falling off, resulting in new connections last year numbering only 4,851 as compared with 5,824 in 1938. This brought the number of this class of consumer to a total of 61,730 (56,000 domestic consumers).

Their power station plant continued to give excellent service and, although the loadings were less favourable than in the previous twelve months, the overall combined efficiency of the stations was a little higher at 24.62 per cent., as against 24.24 per cent.

With regard to sales during 1939, the number of kWh disposed of advanced from 511.5 million in 1938 to 563 million, an increase of 51.5 million kWh, and, in addition, 300 million kWh was exported to the C.E.B., a rise of about 34 million kWh. Last year three contracts with local authorities for bulk supplies were renewed and considerable extensions were made to mains and distribution cables. These latter consisted of 20 miles of high-voltage cables or lines and about 78 miles of low-voltage cables, making the total laid to date 880 miles of high-voltage and 1,240 miles of low-voltage cables.

On the assumption that trading and war conditions would remain more or less the same as at the present time, Mr. Balfour said that the outlook for the current year appeared fairly satisfactory; they had, in fact, started this year showing a slight improvement as compared with the same period last year. The cotton trade was more prosperous, the demand from the textile industry had considerably improved, and the miscellaneous demand was satisfactory.

Mather & Platt, Ltd., held their annual meeting on February 23rd when Mr. L. E. Mather, chairman, who presided, said that a large export trade such as theirs naturally suffered under the present wartime conditions, but they had continued with success to obtain orders in the Empire and neutral countries, and losses in transit had been negligible. Their shops had been fully engaged on direct and indirect Government work and during the course of the past year large extensions to their machine shops had been completed and while part of this area was filled by their normal productions they had additional capacity which was being put into service and would be in full use during the current year. Although the 1939 results were behind those of the previous two years the prospects for 1940 were hopeful.

The Metropolitan Electric Supply Co., Ltd., reports a gross revenue for 1939 of £1,765,430, as compared with £1,707,021 in the previous year, of which sales of electricity yielded £1,690,136, as against £1,655,870. Working expenses rose by £24,568 to £1,300,694 and the cost of electricity advanced from £956,539 to £981,150, leaving £464,736 (£430,895). To this is added interest and dividends on investments and sundry fees of £222,949 (£241,622), making £687,685 (£672,517). Debenture stock interest, sundry loans and consumers' deposits absorbed £73,095. £81,730 is appropriated to "A" and "B" sinking funds, £193,571 goes to depreciation and reserve accounts and £20,943 to No. 2 reserve fund. Dividend on preference stock took £22,500 and the final ordinary dividend is 7 per cent., making 10 per cent. for the year (as against 12 per cent. for 1938, including a bonus of 2 per cent.) leaving £127,297 to be carried forward (£131,452). Meeting: March 5th.

The Bournemouth and Poole Electricity Supply Co., Ltd., reports a net profit of £94,069 for 1939, as against £104,001 for 1938. The final dividend is £8 6s. 2d. per cent., making £14 6s. 2d. per cent. for the year (against £15 per cent.).

The Richmond (Surrey) Electric Light and Power Co., Ltd., reports net profits for 1939 of £18,274, as compared with £21,580 for the preceding year. The final dividend is 3 per cent. (against 4 per cent.), making 6 per cent. for the year (against 7 per cent.).

Clarke, Chapman & Co.'s net profit for 1939, after providing for all charges, contingencies and taxation, rose from £96,841 in 1938 to £109,970. Depreciation accounted for £17,795 (£14,463), directors' fees £3,064 and preference dividend £4,890. An ordinary dividend of 12½ per

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STOCKS AND SHARES

TUESDAY EVENING.

OUT of the 150 prices quoted in the succeeding page nearly one-half of them show advances this week. The improvements are spread over practically every section of these markets, as also to others in the Stock Exchange.

Next week there will be distributed the first amounts due on the American securities requisitioned by the British Government. In advance of these payments, a good deal of money is being utilised in the purchase of home industrials. The greater part of the requisitioned securities take the form of common shares, and it is certainly the experience of stockbrokers so far that holders of the shares due to be paid off next week, exhibit a predilection for ordinary or deferred shares in the home companies rather than for gilt-edged and safety-first securities.

The rises, it will be observed, are in a good many cases substantial. In addition to those quoted in our lists, a number of others have occurred, in preference shares and debenture stocks, in undertakings connected with electricity supply and development. Business is tolerably active in the industrial markets. In spite of a mild reaction from the best on Tuesday in this week, prices hold their ground with notable strength.

London Electricity Supply Results

County of London Electric proved the market to have been over-cautious in discounting a reduction in the 1939 dividend. The final distribution again brings the total to the equivalent of 10½ per cent.—the same rate as has been paid since 1931, when the capital was nearly £1½ millions smaller than it is now. Net profits are reported to be about £190,000 lower, at £1,297,000. Metropolitan Electric has done the expected in repeating the dividend at 10 per cent., but omitting the 2 per cent. bonus paid for 1938. The South London dividend is maintained at 7 per cent. Since the City of London, Northmet Power and London Electric companies' dividends have all been up to expectations, the London group can be accounted to have produced a good dividend crop. In viewing the current year's prospects it is, of course, not overlooked that four months of wartime conditions have made their presence felt in the revenue accounts, and have generally reduced the earnings cover for the dividends. (The South London was exceptional in showing a higher net profit for 1939.) Thus it is that the London companies' shares are still quoted on a basis of yield which leaves a margin for contingencies. The last important dividend announcement in the group will be from London Associated, which is expected to cut the distribution below last year's 7 per cent. Metropolitan Electric is proposing to issue half a million 4½ per cent. preference shares as soon as Treasury sanction has been given.

Provincial Companies

Midland Counties Electric is a holding company, and the full accounts show that trading profits of the operating concerns in 1939 were very much the same as previously. They have, however, made larger allocations to reserves, so that the revenue of the parent is reduced to some extent. Other results issued to date, including those of Lancashire Electric, Scottish Power, Clyde Valley and North-Eastern, generally confirm the impression that companies with a large industrial load are going to hold their own satisfactorily, in wartime, against the restrictions which apply particularly in the towns, and against the mounting costs of production.

Extent of the Improvement

The following table compares the present prices of representative shares in the various electrical groups, with those of about a month ago and with the pre-war quotations.

Stock or Share	1939 End-August	1940 Jan. 23rd	1940 Now
County of London Electric	39/6	35/9	41/3
Edmundsons	23/6	23/6	27/–
Metropolitan Electric	43/9	37/–	40/9
Midland Counties	37/6	33/9	38/3
Scottish Power	32/6	32/6	37/6
Central Elec. Board 5% Stock, 1955/75 ...	107	110	111
London Transport Board 4½% "A" Stock	103	107½	114½
Cable and Wireless Ord.	49½	60½	65½
" " 5½% Pref.	85½	98½	98½
Southern Railway 5% Pfd.	58	68	76½
" " 5% Pref.	80	97½	102½
Assoc. Electrical Industries	39/–	38/3	42/6
British Insulated	83/9	78/9	90/–
Crompton Parkinson	17/6	17/6	20/–
G.E.C.	75/–	75/–	82/6
Johnson & Phillips	38/9	42/6	47/6
Tube Investments	86/3	90/–	96/3
British Aluminium	56/3	50/–	55/–
Electric Construction	35/–	33/9	36/3
Vickers	17/9	18/–	21/3

English Electric Meeting

Mr. G. H. Nelson dealt categorically, at last week's meeting, with the wartime problems which confront the English Electric and many other companies. Out of the five chief headings under which he placed them, at least four were shown to be largely outside the company's own control. Supplies of materials, working costs, and taxation are matters largely or entirely in Government hands. The results of enemy action cannot be foreseen. Under the fifth heading—the possibility of a sudden cessation of hostilities—the chairman disclosed the existence of important contracts deferred for the duration of the war, and constituting therefore a useful reserve for future times. The basis which the company has to adopt for calculating the liability to E.P.T. is often taken as an example by the critics of that tax, and the chairman made out a sound case for special consideration, based on the evidence that the Company was being penalised for its successful enterprise.

Dealings in Transport "C" Again

The strange position whereby London Transport "C" stock has been virtually unnegotiable for six months ended last week, when the Board declared an interim dividend of 1½ per cent. and the fixed minimum price of 65 was immediately abandoned. Left to find its own level, the stock opened at a price of around 51. The rate of the interim payment was something of a surprise, since under the wartime compensation scheme the guaranteed earnings represent over 1½ per cent. for a full year. Earnings of just over 3 per cent. would be available if the revenue pool were to receive an extra £3½ millions above the guaranteed minimum; and would reach the standard 5½ per cent. only in the later stages of the scheme. By implication, revenue is supposed now to be running into the pool at the level represented by the second stage. Assuming a distribution of 3 per cent. for the year, the present price of the stock, 47½ ex dividend, gives a yield of just under 6 per cent., with some prospect of a return exceeding 10 per cent. if optimistic estimates of wartime railway traffics are reached. The tendency is to regard the Board as fortunate in sharing wartime revenues with the main-line companies, since the war has evidently increased the latter's traffic, while diminishing the use of the Board's services. After the war, the boot is likely to be on the other foot. There is, therefore, no strict comparison between the "C" stock and the junior railway issues.

Industrial Markets

Various explanations are offered in connection with the price-rises which, in the past week, substantially altered the complexion of the industrial markets. One points to the fact that in January the gilt-edged market had taken a rapid upward turn, and in so doing established a new standard of yields, with which other markets had been slow to fall into line. Another, arising from the same cause, refers to the necessity for capital to go even further afield in search of a living rate of interest. Thirdly, there remains the chronic shortage of stock, and the present system of cash dealings, which is apt to create what the Stock Exchange calls "one-way markets," meaning that the movement of prices is inclined to give a magnified idea of the amount of buying or selling in process. This is not to suggest that the buying has been on a limited scale. This new upward move came to life immediately after the news of the Treasury's first requisitioning of dollar stocks, and was activated by the idea of anticipating the release of some £20 millions (according to quite unofficial estimates) for reinvestment in the home markets. Once the inertia of preceding weeks had been broken, the movement gathered momentum.

To take a few price fluctuations at random, British Aluminium and Enfield Cables have both risen 5s. to the common price of 2¾. British Insulated put on 6s. 3d., advancing to 90s. Callenders at 66s. 3d. are 3s. 9d. better, so are General Electrics at 82s. 6d. and Tube Investments at 96s. 3d. Gains of about 2s. 6d. appear in a number of cases. Even Brush shares have risen 6d., to 4s. 6d. English Electrics at 33s. 3d. are 3s. 3d. to the good. Mather & Platt at 40s. have recovered 3s. of their last week's fall.

British Electric Traction deferred at 825 is 75 points higher. Thomas Tilling shares are ⅛ up at 45s. In other directions, Great Northern Telegraphs, on the Continental developments, are 20s. lower at 19½. All this week's changes in electricity supply shares are upward. Tokyo Electric 6 per cent. bonds, down to 33 a few months ago, are now 70.

Stock Exchange Settlements

A growing movement in the Stock Exchange favours the re-establishment of fortnightly settlements, such as ruled before the war, but which were superseded by the present system of dealing for cash. The interest of the investor is held, and rightly held, to be prejudiced by a principle which was introduced, primarily, for the purpose of making speculation impossible. The Treasury argument is that the national interest demands complete suspension of any facilities such as might encourage the speculative spirit. Hence the necessity, according to this line of contention, for all transactions to be settled for cash. The result, as previously mentioned here, and as intensified by to-day's conditions of demand, is that the dealer in the Stock Exchange market is frequently afraid to make a price—and so run the chance of having shares bought from him—unless he has the stock on his book, or unless he knows where it can be bought. Had he fourteen days—the usual duration of a Stock Exchange settlement—in which he might expect stock to come in from deceased accounts or other sellers—he would take the ordinary chance and make a price.

The prospective buyer is accordingly told that there is no stock in the market; that the dealers will buy, but not sell; and that he, the would-be purchaser, can have his name put down, if he likes, on a list already started. Reversion to a bi-monthly, or even the introduction of a once-a-week settlement, would have the effect of giving greater flexibility to the jobber's enterprise.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Feb. 27	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	56/-	15	15	61/3	—	4 17 10
British Power and Light	30/9	21/-	7	7	29/6xd.	+1/9	4 15 0
City of London	33/9	22/-	7½	7½	27/6xd.	—	5 7 2
Clyde Valley	38/6	26/9	8	8	37/6	+6d.	4 5 5
County of London	46/9	28/-	10½	10½	41/3	+3/-	5 1 8
Edmundson's:							
7% Pref.	31/6	27/6	7	7	30/-	—	4 13 4
Ord.	27/9	18/-	9	6	27/-	+1/6	4 9 0
Elec. Dis. Yorkshire	41/6	32/-	9	9	38/3xd.	+⅛	4 14 2
Elec. Fin. and Securities	48/3	39/-	12½	12½	40/-	—	6 5 0
Elec. Supply Corporation	51/9	40/-	12	12	44/-	+1/6	5 9 0
Isle of Thanet	20/-	15/-	4	4	15/6	—	5 3 3
Lancs Light and Power	34/6	25/-	7½	7½	32/6	+⅛	4 12 4
Llanelly Elec.	22/6	16/6	5½	5½	20/6	—	5 7 4
Lond. Assoc. Electric	30/-	18/-	7	7	20/-	—	7 0 0
London Electric	34/3	20/-	7	7	27/-	—	5 3 8
London Power Deb. Red.	106½	97	5	5	104½xd.	+2	4 15 6
Metropolitan	51/-	32/6	12	10	40/9	+⅛	4 18 5
Midland Counties	39/6	30/-	8	8	38/3xd.	+⅛	4 3 4
Mid. Elec. Power	41/9	33/6	8	9	37/6	+6d.	4 16 0
Newcastle Elec.	28/9	25/-	7	7	28/9	+⅛	4 17 5
North Eastern Electric:							
Ordinary	32/3	23/6	7	7	31/-	+2/-	4 10 4
7% Pref.	32/6	26/-	7	7	31/6	—	4 9 0
Northampton	48/-	41/-	10	10	42/6	—	4 15 0
Notting Hill 6% Pref. (£10)	13½	10½	6	6	10½	—	—
Northmet Power:							
Ordinary	46/6	30/6	10	10	41/3xd.	+2/3	4 17 0
6% Pref.	29/-	23/6	6	6	28/6	—	4 4 3
Richmond Elec.	29/-	21/6	7	7	23/9	—	5 18 0
Scottish Power	38/9	27/6	8	8	37/6	+⅛	4 5 4
Southern Areas	22/9	17/-	5	5	20/-	+6d.	5 0 0
South London	30/9	22/-	7	7	22/-	—	6 7 3
West Devon	23/3	18/-	5	5	18/9	—	5 6 8
West Glos.	21/3	15/-	2	2½	18/9	—	2 13 4
Yorkshire Elec.	38/6	27/9	8	8	38/9	+1/9	4 2 5
Overseas Electricity Companies							
Atlas Elec.	4/3	1/6	Nil	Nil	2/9	—	—
Calcutta Elec.	39/-	25/-	10*	10*	33/6	+6d.	—
Cawnpore Elec.	34/6	27/3	10	10	28/9	—	—
East African Power	26/3	20/-	7	7	24/6	+1/-	5 14 3
Jerusalem Elec.	24/6	21/-	7	7	22/6	+6d.	6 14 4
Kalgoorlie (10/-)	10/6	9/-	7½	7	12/-	+1/-	5 16 8
Madras	31/-	21/3	8*	8*	23/9	+⅛	—
Montreal Power	35½	30	1½	1½	33	+1	—
Palestine Elec. "A"	27/3	19/6	7½*	5*	23/9	—	4 4 2
Perak Hydro-electric	19/6	12/6	6	2½	18/9	—	2 13 4
Shawinigan Power	25	20	83cts.	90cts.	22	+½	—
Tokyo Elec. 6%	63	33	6	6	70	+2½	8 11 6
Victoria Falls Power	73/9	60/-	12½	15	72/6	—	4 2 8
Whitehall Investments Pref.	19/6	10/-	7½	7½	17/6	+6d.	8 11 6
Public Boards							
Central Electricity:							
1950–70	112	103	5	5	108	—	4 12 7
1955–75	115½	104½	5	5	111	+1	4 10 0
1951–73	106½	101	4½	4½	106	—	4 5 0
1963–93	95½	84	3½	3½	95	—	3 13 8
London Elec. Trans Gtd.	88½	83	2½	2½	91½	—	2 10 4
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport							
A	114½	103	4½	4½	114½	—	3 18 6
B	117½	102	5	5	113½	−2	4 8 1
C	83½	64½	1½	—	47½xd.	−16½	—
West Midland Joint Elec.,							
1948–68	112½	104½	5	5	106½	—	4 14 0
Telegraph and Telephone							
American Tel. & Tel.	210	159	9	9	212½	+3	4 4 8
Anglo-Am. Tel.:							
Pref.	101½	82	6	6	98½	—	6 1 10
Def.	23⅜	17	1½	1½	23	+½	6 10 4
Anglo-Portuguese	24/-	16/6	8	8	22/6	+⅛	7 2 3
Cable & Wireless:							
5½% Pref.	97	75	4½	5½	98½	—	5 11 8
Ord.	57⅛	35	4	4	65½	+2	6 2 0
Income	100	85½	—	—	99½	+1	4 0 5
Canadian Marconi $1	6/-	3/9	Nil	4	5/6	—	—
Globe Tel. & Tel.:							
Ord.	32/3	22/6	7½*	7½*	30/-	—	5 0 0
Pref.	26/9	20/-	6	6	27/6	+⅛	4 7 5
Great Northern Tel. (£10)	38	18	20	20	19½	−1	10 5 4
Inter. Tel. & Tel.	10½	5	Nil	Nil	5	—	—
Marconi-Marine	30/-	23/-	7⅛	10	28/9	+⅛	6 19 2
Oriental Telephone Ord.	2½	42/6	12*	12*	2½	+⅛	4 16 0
Telephone Props.	14/-	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/-)	10/-	6/3	10	10	9/-	+6d.	5 11 1
Western Union	40½	19½	2⅞	—	32½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	4/-	—	—
4% Inc.	16	5	Nil	Nil	9	—	—
British Electric Traction:							
Def. Ord.	950	500	5	5	825	+75	—
Pref. Ord.	164	115	8	8	160	—	5 0 0
Bristol Trams	52/6	35/-	10	8*	48/3	+2/-	3 6 6
Brazil Traction	13	6½	$1	50c.	10	+½	—
Calcutta Trams	25/6	20/9	8	8	23/6	—	6 16 2
Cape Elec. Trams	18/-	16/9	5	5	17/-	—	5 17 8
Lancs Transport	37/9	27/6	10	10	32/6	+⅛	6 9 0
Mexican Light:							
1st Bonds	35	20	5	5	30½	—	—
Rio 5% Bonds	82	47	5	5	78	—	6 8 2
Southern Rly.:							
5% Prefd.	75½	48	5	5	76½	−1½	6 10 9
5% Pref.	99½	79	5	5	102½	—	4 17 6
T. Tilling	2½	32/6	10	10	45/-	+1/3	4 9 0
Tilling & B.A.	54/6	43/9	9*	8*	47/6	—	3 7 10
West Riding	37/9	30/-	10	10	33/6	+1/6	5 19 5
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	17/6	15	15	17/6	—	—
Assoc. Elec.:							
Ord.	45/3	30/-	10	10	42/6	+1/9	4 14 0
Pref.	36/6	30/-	8	8	35/-	—	4 11 5
Automatic Telephone & El.	48/9	37/-	10	12½	45/-	+⅛	5 11 2
Babcock & Wilcox	48/-	37/-	10	12½	49/6	+½	5 0 10
British Aluminium Ord.	61/3	48/-	12½	12½	55/-	+5/-	5 4 9
British Insulated Ord.	88/-	70/3	20	20	90/-	+6/3	4 11 6
British Thermostat (5/-)	16/-	11/6	18½	18½	15/-	+⅛	6 3 4
British Vacuum Cleaner (5/-)	22/6	8/-	40	12½	12/6	—	5 0 0
Brush Ord.	5/9	2/6	Nil	Nil	4/6	+6d.	—
Callender's	92/-	50/-	20	15	66/3	+⅛	4 10 8
Chloride Elec. Storage	82/-	62/-	20	15	3½	—	4 5 9
Consolidated Signal	96/-	60/-	36½	17	3½xd.	+½	5 4 7
Crabtree (10/-)	25/6	16/6	17½	17½	21/3	—	8 4 9
Crompton Parkinson:							
Ord. (5/-)	21/-	12/6	15	20	20/-	+⅛	5 0 0
E. K. Cole (5/-)	9/-	2/6	10	Nil	3/6	—	—
Elec. & Musical Industries (10/-)	14/9	6/6	5	Nil	8/6	+6d.	—
Electric Construction	40/6	28/-	12½	13½	36/3	+⅛	7 8 9
Enfield Cable Ord.	58/-	37/6	25	16½	55/-	+½	5 18 3
Electrical Switchgear (10/-)	27/-	23/-	16	10	21/3	—	4 14 3
English Electric	36/6	25/-	10	10	33/3	+3/3	6 1 0
Ensign Lamps (5/-)	16/9	13/9	25	25	15/-	—	8 6 8
Ericsson Tel. (5/-)	43/-	32/3	25*	25*	37/6	+⅛	3 6 8
Ever Ready (5/-)	26/6	16/9	35	30	26/6	—	5 13 2
Falk Stadelmann	27/-	18/-	10	6	17/6	—	6 17 4
Ferranti Pref.	25/6	21/-	7	7	23/9	—	5 18 0
G.E.C.:							
Pref.	32/9	25/-	6½	6½	32/6	+⅛	4 0 0
Ord.	82/-	61/-	17½	20	82/6	+⅛	4 16 10
Greenwood & Batley	29/-	20/-	7	15	25/-	—	12 0 0
Hall Telephone (10/-)	22/3	7/-	15	15	18/9	—	8 0 0
Henley's (5/-)	21/-	13/9	20	20	21/3	+⅛	4 14 1
4½% Pref.	23/-	18/-	4½	4½	20/-	—	4 10 0
Hopkinsons	46/9	37/-	12½	15	43/9	—	6 17 0
India-Rubber Pref.	22/-	17/9	5½	5½	20/-	—	5 10 0
Intl. Combustion	121/3	97/-	32½	32½	5⅝	+⅛	5 10 6
J. Lucas	61/-	42/6	15	15	57/6	+⅛	5 4 4
Johnson & Phillips	42/6	32/-	12½	12½	47/6	+⅛	5 5 1
Lancashire Dynamo	72/-	50/-	25	25	57/6	—	8 14 0
Laurence Scott (5/-)	12/-	8/6	15	15	10/-	+6d.	7 10 0
London Elec. Wire	31/6	25/-	12	7½	25/-	—	6 0 0
Mather & Platt	50/3	37/6	13½	10	40/-	+3/-	5 0 0
Metropolitan Elec. Cable Pf.	21/3	21/-	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	86/3	+⅛	4 12 8
Pye Deferred (5/-)	11/6	7/-	25	25	7/6	—	16 13 4
Revo (10/-)	35/6	22/-	17½	17½	22/6	+⅛	7 15 7
Reyrolle	61/-	52/-	12½	12½	58/9	+⅛	4 5 0
Siemens Ord.	26/9	17/-	7⅛	7⅛	23/9	+⅛	6 6 4
Strand Elec. (5/-)	5/6	1/3	10	4	2/-	—	8 0 0
S. Smith (1/-)	9/6	5/6	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/-)	15/-	9/6	20	20	11/3	—	8 18 0
Telegraph Condenser (10/-)	7/6	5/-	5	—	8/9	—	—
Telegraph Construction	2½	27/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/-)	10/-	7/-	9	9	8/6	—	5 9 1
Tube Investments	91/6	68/-	23¾	23¾	96/3	+⅛	4 19 0
Vactric (5/-)	4/3	2/-	4	Nil	2/6	—	—
Vickers (10/-)	24/6	14/6	10	10	21/3	—	4 14 1
Ward & Goldstone (5/-)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	38/-	17½	10	43/9	+⅛	4 11 5
Walsall Conduits (4/-)	31/9	21/3	55	55	26/3	+⅛	8 7 8
West, Allen (5/-)	7/6	5/-	7½	10	7/-	+6d.	7 2 10

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia. — MELBOURNE. — April 2nd. State Electricity Commission of Victoria. Cable for three-phase 6.6-kV system. (T. 15010-40.)*

Insulated cable. (T. 16144/40.)

Switchgear. (T. 16495/40.)*

BRISBANE.—April 16th. City Electric Light Co., Ltd., 44-, 33- and 11-kV metal-clad switchgear. (T. 16129/40.)

Barnoldswick.—March 9th. U.D.C. Two 750-kVA indoor type oil-cooled transformers, two triple-pole metal-clad oil circuit-breaker units and p.i. cables for one year. (See this issue.)

Belfast.—March 1st. Electricity Department. 6.6-kV switchgear and cabling at Harbour power station. (February 16th.)

March 8th. Electricity Committee. Electrical materials. (February 23rd.)

Dundee.—March 6th. Lighting Committee. Various works, including electric lighting installation, at premises at No. 1, Lochee Road. City quantity surveyor, 21, City Square.

Hastings.—March 4th. Electricity Department. One 3,000-kVA Scott-connected transformer. (February 16th.)

India. — NEW DELHI. — March 7th. Stores Department. Electrical table standards, plugs, lampholders and shades. (T. 16398/40).*

April 4th. Wall plugs and ceiling roses. (T. 16398/40.)*

MADRAS.—March 27th. Electricity Department. Additional plant for the Bezwada thermal scheme comprising one 3,000-kW steam turbo-alternator set, one 33,000-lb. per hr. boiler and accessories, indoor and outdoor switchgear and accessories, and extension of pipework. Specification E.131 from the Executive Engineer, Electrical and Mechanical Division, Chepauk (Rs. 25s. per set).

April 9th. One 1,500 kVA, 3.3/11-33 kV power transformer and arc suppression coil for Bezwada scheme. Specification E.132 from the Executive Engineer, as above (Rs.10 each).

Iraq.—BAGHDAD.—March 16th. Mosul Electricity and Water Board. Gas-filled and vacuum coil-filament lamps, chlorinating plant, &c. (T. 15998/40.)*

Leeds.—Education Committee. Repairs to buildings during the twelve months ending March 31st, 1941, including electrical work. G. Guest, director of education.

Leyton.—March 11th. Electricity Department. Cables for one year. (February 23rd.)

Littleborough.—March 2nd. U.D.C. Twelve months' supplies of cables and AC house service meters. W. C. C. Hawtayne, consulting engineer to the Council, 55, The Pryors, Hampstead, London, N.W.3.

Linsdale (BUCKS).—March 8th. U.D.C. Additions to existing pumping station, including a vertical spindle centrifugal borehole pump of 7,500 gal. per hour capacity, driven by an electric motor and arranged for automatic operation, with recording equipment, &c. Sands & Walker, Milton Chambers, Nottingham (deposit £2 2s.).

Manchester.—March 8th. Electricity Committee. Neutral earthing switchgear and resistors. (February 23rd.)

New Zealand. — WELLINGTON.—Public Works Department. May 14th. Control and relay panels. (T. 16070/40.)*

March 12th. Switchgear. (T.Y. 16311/40.)*

May 21st. Control and relay panels. (T. 16069/40.)*

May 21st. Public Works and Tenders Committee. Control and relay panels for Mt. Roskill sub-station, Auckland. (T. 16068/40.)*

Norwich.—March 11th. Town Council. One Lancashire steam boiler with electrically driven mechanical stoker. City engineer, City Hall (deposit £2).

Sheffield.—March 11th. Town Council. Two sets of totally enclosed double-helical double-reduction gear units and three sets of horizontal centrifugal pumps coupled to automatically controlled electric motors. J. H. Henderson, Sewage Disposal Department, Wincobank (deposit £1 1s. each item).

South Africa.—CAPE TOWN.—April 1st. Electricity Department. One 2-ton, two 5-ton and two 10-ton capacity overhead electric travelling cranes. (T. 15897/40.)*

March 15th. Electricity Supply Commission. Two 50-kVA, two 30-kVA, six 10-kVA and six 5-kVA three-phase and six 3-kVA single-phase transformers. (T. 16309/40.)*

PRETORIA.—March 14th. Union Tender and Supplies Board. Ventilating plant. (T. 16297/40.)* (T. 16295/40.)* Woodworking machinery and spray painting outfit. (T. 16293/40.)* Vertical steam boiler. (T. 16299/40.)*

Tredegar.—March 4th. U.D.C. Twelve months' supplies of electrical materials. (February 23rd.)

Walsall.—March 5th. Public Assistance Department. Electric lamps. C. S. Fothergill, Public Assistance Officer, 29, Leicester Street.

Orders Placed

Coventry.—Education Committee. Accepted. Electrical installation at the new secondary girls' school (£2,333).—G. R. Marson.

Great Yarmouth.—Electricity Committee. Recommended. Portable coal conveyor (£115).—Bagshawe & Co. Fire protective equipment (£1,525).—Mather & Platt.

Isle-of-Ely.—County Council. Accepted. Traffic signals at Broad Street, March (£736).—Automatic Telephone & Electric Co.

Jarrow. — Town Council. Accepted. Electrical installation at the Infectious Diseases Hospital.—Hodgson & Coley.

London.—HAMMERSMITH. — Electricity Committee. Accepted. Cable stripping machine (£38).—Yorkshire Switchgear & Engineering Co.

Recommended. Supplies for twelve months from April 1st, 1940: E.h.v., h.v. and l.v. cables.—Henley's. L.v. cables (twin).—Pirelli-General Cable Works. Insulated wires.—Edison Swan Electric Co.

STOKE NEWINGTON.—Electricity Committee. Recommended. Electrical installation work for a further six months.—W.B. & H.C. Cables.

Portland.—Electricity Committee. Accepted. Transformer (£215) and switchgear (£255).—Met.-Vick. Elecl. Co.

Ramsgate.—Town Council. Accepted. Installation of a 2-kW generator machine and batteries (which have been purchased by the Corporation), with the necessary wiring to lighting points in A.R.P. tunnels (£204).—Laslett & Co.

Financial Section (*Concluded from page 260*)

Reports and Dividends—cont.

cent., as against 10 per cent. in 1938, is declared, and £20,000 (£21,480), goes to reserve, leaving £32,155 (£27,934) to be carried forward.

The Midland Counties Electric Supply Co., Ltd., reports a trading profit from the operating companies, for 1939, after allowing for income tax, of £805,487, as against £812,827 in 1938, from which is deducted £415,547 (£383,200) for depreciation and reserve. The net revenue of the controlling company was £375,804 (£413,690), loan and debenture interest requires £41,552 (£40,744), and £71,436 (£80,964) goes to reserve. A final ordinary dividend of 5½ per cent., maintaining 8 per cent. for the year, is recommended, and £16,354 (£15,162) is carried forward.

The Bognor Gas & Electricity Co.'s profit for 1939 rose from £23,262 in 1938 to £24,472, of which electricity sales contributed £13,485 (£13,397). After paying bank interest, interest on debentures, half-year dividend to June last, taxation and cost of amalgamation, final dividends, making authorised rates for the year, were declared as follows: £8 per cent. per annum on original "A," £9 4s. per cent. per annum on original "B," £8 per cent. per annum on additional "A" and £7 per cent. per annum on new consolidated stock. A sum of £18,614 (£19,938) is carried forward.

Bristol Tramways & Carriage Co., Ltd., reports a net profit for 1939 of £221,117, as compared with £226,685 for 1938. Preference dividend requires £20,000 and the final ordinary dividend is 4 per cent., making 8 per cent. for the year, tax free, as against 10 per cent. Contingencies and renewals rose by £25,000 to £75,000, leaving £25,256 (£23,165) to be carried forward. Further tramway services have been discontinued and omnibuses substituted, but in view of war conditions the final stage of conversion has been postponed.

The Shawinigan Water & Power Co.'s gross earnings for 1939 amount to $15,133,527, an increase of $745,527 over the previous year, while the net balance before allowing for depreciation and taxes is $4,523,826, an advance of $275,325. Dividends rose from 85 cents to 90 cents, which, with depreciation absorbing $1,800,000 and taxes $419,000, leaves an earned surplus of $2,215,391.

The Lancashire United Transport & Power Co., Ltd., earned a net profit of £72,195 for 1939, as compared with £68,121 in the previous year. After transferring £10,000 to reserve for additional taxes and £17,724 to general reserves, a final ordinary dividend of 6 per cent. is recommended, again making 10 per cent. for the year. Combined traffic receipts of the operating companies rose from £439,976 in 1938 to £465,827.

Thos. W. Ward, Ltd., are paying an interim ordinary dividend of 3¾ per cent., less tax, in respect of the year ending June 30th, 1940.

Electrical Distribution of Yorkshire, Ltd., is paying a final dividend of 3.981 per cent., making 9 per cent. for the year, as in 1938.

The British Oxygen Co., Ltd., has declared a final ordinary dividend of 10 per cent., less tax at 7s. (after Dominion tax relief 6d.), making 17 per cent. for the year, the same as in 1938.

Waygood-Otis, Ltd., is paying a final dividend of 12½ per cent., as in 1938, and a bonus of 17½ per cent. (as against 20 per cent), making 42½ per cent. for the year (45 per cent.).

The Newcastle and District Electric Lighting Co., Ltd., has declared a first and final dividend for 1939 of 7 per cent. (same).

The Ransome & Marles Bearing Co., Ltd., is maintaining its interim dividend at 9 per cent.

Ward & Goldstone, Ltd., have announced a final dividend on preference stock at 3½ per cent. actual (£3 10s. per £100 stock) less tax at 8s. 6d., making 7 per cent. for the year ending March 31st.

The North-Eastern Electric Supply Co., Ltd., is paying a final dividend of 4½ per cent., making 7 per cent. for the year (same).

The London Passenger Transport Board announces a dividend of 1½ per cent. on the £25,698,802 "C" stock on account of the year to June 30th next. In 1938 the Board paid an interim dividend of 1½ per cent. on this stock, but no final payment was made.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory extension, Adhesive Tapes, Ltd., Brunel Road; A. Savill & Sons.

Factory extension, A. Luson & Sons, Ltd., Standard Road; A. Hosken, architect.

Factory additions, Chase Road; Expandite Products, Ltd.

Works additions, Canham Road; C.A.V., Ltd.

Ashton - under - Lyne. — Saw mill, Katherine Street; Webster Holt & Co., Ltd.

Aylesbury.—Extensions to County Garage, Buckingham Street; Aylesbury Motor Co.

Barnstaple.—Parish hall at Fremington; T. C. Friend, architect, Bridge Chambers, Barnstaple.

Bishop Auckland.—Erection of 14 public shelters for the U.D.C.; T. Swan & Co., Ltd., builders, Consett.

Blackburn.—Bus station, Railway Road; borough engineer.

Blackpool.—Houses (£22,060), St. Walburga's Road and St. Anne's Road; borough engineer.

Additional accommodation at central fire station; borough surveyor.

Extensions to premises, Talbot Road; Princess and Ribble Laundries, Ltd.

Boston.—Extensions to factory; E. Fogarty & Co., Ltd., Trinity Street.

Bradford.—Licensed premises, Chellow Grange Road; Melbourne Brewery.

Brandon and Byshottles (Co. DURHAM). —Erection of 15 public shelters; U.D.C. surveyor.

Bristol.—Central kitchen, Novers; city architect.

Bury.—Employees' shelters; James Kenyon & Son, Ltd., Roach Bank Mill.

Carlisle.—Shelter at St. Cuthbert's School; P. Dalton, city engineer, 18, Fisher Street, Carlisle.

Chadderton.—Hotel, Greengate, for Major Radclyffe, Hyde, Wareham; Cobbett, Wheeler and Cobbett, Manchester.

Chesterfield. — Houses (63), Mosborough; R.D.C. surveyor, Council Offices.

Corby.—Enlargement of technical institute (£5,430); Stewarts & Lloyds, Ltd.

Coventry.—Houses (21), Cornelius Street, for S. Sutton, Tile Hill Lane.

Croydon.—Nurses' home (£15,616), Mayday Hospital; borough surveyor.

Cumberland.—Alterations to Kirkbride police station for the C.C.; J. H. Haughan, architect, 4, Alfred Street North, Carlisle.

Darlaston (STAFFS).—Assembly hall, adjoining the Methodist Church; J. & F. Wootton, Ltd., contractors, Pinfold, Bloxwich, Walsall.

Darlington.—Alterations to premises in Skinnergate for the Society of Friends; H. E. Jarvis, architect, 44, High Row, Darlington.

Devon. — County library scheme (£9,879), for C.C.; county architect, Heavitree Road, Exeter.

Durham.—Small holdings (£10,428); County Agricultural Committee.

Eckington (DERBYSHIRE). — Cottages and garage at waterworks for the North-East Derbyshire Joint Water Committee; A. Mason (Contractors), Ltd., Sutton Road, Mansfield.

Eire (DUBLIN).—Dwellings (128), Railway Street housing area; city treasurer, Exchange Buildings, Lord Edward Street.

Fareham.—Extensions to Isolation Hospital; U.D.C. surveyor, Council Offices.

Felling-on-Tyne (Co. DURHAM).—Rebuilding works of Noble Lund, Ltd. (£8,000).

Glasgow.—Orthopædic unit at Philipshill; Victoria Infirmary governors.

Greenock.—Fire station; burgh surveyor.

Helmsley (YORKS).—Conversion of building into fire station; R. P. Brotton, architect, Chop Gate, Middlesbrough.

Hemsworth.—Church, Common Road; Rev. L. Sibellas, South Kirkby Parish Church.

Hexham.—Hotel, Mickley; Dr. J. Charlesworth, Newcastle-on-Tyne.

Houghton-le-Spring.—Completion of 48 houses for the U.D.C.; surveyor.

Hyde.—Store at works of Jos. Adamson & Co., Ltd.

Kidsgrove.—Fire station; U.D.C. surveyor, Council Offices.

Lichfield.—New factory, Chase Terrace, Burntwood; T. Richards, Edial House, Lichfield.

Linslade. — Extensions, pumping station, for U.D.C.; Sands & Walker, engineers, Milton Chambers, Nottingham.

Loddon.—Houses (34), for R.D.C.; surveyor, Council Offices, Loddon, near Norwich.

London.—POPLAR.—Rebuilding Steam Packett Inn, Garford Street; S. A. S. Yeo, architect, 56, Station Chambers, Turnmill Street, E.C.1.

Macclesfield.—Warehouse, King Edward Street, for Neckwear, Ltd., Grosvenor Road; Cooper Bros. (Builders), Ltd., Catherine Street, Macclesfield.

Manchester.—Rebuilding Three Tuns Hotel, Collyhurst, for Threlfalls Brewery, Ltd., Cook Street, Salford; B. Waterhouse, architect, 134, Deansgate, Manchester.

Additions to works, Sharston Road, Wythenshawe, Northenden, for T. French & Sons, Ltd., Chester Road Mills; W. Thorpe & Son, Ltd., contractors, Chester Road, Corubrook, Manchester.

Additions to works, Great Jones Street and Boundary Street, Gorton; B. Smith, contractor, 60, Chapman Street, Hulme, Manchester.

Cleansing depôt and first-aid post, Church Street; W. Johnson & Son, architects, 27, Oldham Road, Miles Platting.

Factory, Bradnor Road, Northenden, for C. H. Johnson & Son, Smedley Lane, Cheetham; L. Brown & Sons, Ltd., contractors, Wilmslow, Cheshire.

Store, rear of premises, Girton Street and back Piccadilly, for C. & A. Modes, Ltd., Oldham Street; North & Partners, architects, Townsend House, Greycoat Lane, London, S.W.1.

Newcastle-on-Tyne.—Additions to Benwell sewage disposal works, for the City Council; Hadden and Hillman, Ltd., builders, 127, New Bridge Street, Newcastle.

Northern Ireland.—BELFAST.—Trolley-bus depôt, Short Strand; city engineer, City Hall.

Oldham.—Extensions to nurses' home, Oldham Royal Infirmary; E. Simister, architect, York Chambers, Yorkshire Street.

Oundle.—Rebuilding Montague Arms, Barnwell; Smith & Co., The Brewery, Oundle.

Radnorshire.—County school, Llandrindod Wells; county architect, Llandrindod Wells.

Rothwell.—Fire station, Church Street, for Rothwell and Stanley Fire Brigade Joint Committee; F. Hartley, architect, Council Offices.

Seaham.—New offices, for U.D.C.; P. L. Browne, Son and Harding, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

Sedgefield.—Erection of 27 public shelters for the R.D.C.; T. Swan & Co., Ltd., builders, Consett.

Cinema, Front Street; W. W. Turnbull.

Shrewsbury.—Structural alterations to the Crown Hotel, St. Mary's Street; Scott Deakin, architect, Talbot Chambers, Shrewsbury.

Southam.—Adaptation of Yew Tree House for offices and fire station; R.D.C. surveyor, Council Offices.

Spennymoor.—Erection of 13 shelters for the U.D.C.; builders: W. Wilson, Spennymoor, T. Swan & Co., Ltd., Consett, and A. E. Hobbs, Stockton.

Stanion (NORTHANTS).—Quarry development; Stewarts & Lloyds, Ltd.

Stockport.—New Dial Stone Hotel for Frederic Robinson, Ltd., Unicorn Brewery.

Stourbridge.—Hotel, Cradley Heath, for Ansell's Brewery, Ltd., Park Road, Aston, Birmingham.

Sunderland.—Extensions in Fawcett Street, for F. W. Woolworth & Co., Ltd., 1, New Bond Street, London, W.1.

Tipton.—Factory extensions, Sheepwash Lane; Great Bridge Foundry Co., Ltd.

Rebuilding the Waggon and Horses Hotel, Tividale, on a new site; A. T. Butler, architect, 14, Waterloo Road, Wolverhampton.

Todmorden. — Alterations to Harley House Mill, for S. & A. Barker (Successors), Ltd., Adamroyd Mill.

Tonbridge (KENT).—Fire station, Standings Cross, Matfield; R.D.C. surveyor, Council Offices.

Wakefield.—Hotel at Flanshaw, for Beverley Bros., Ltd., Eagle Brewery; Simpson and Moxon, architects, South gate Chambers.

Block of shops and offices, Bull Ring; Wigram Family Settled Estates, Ltd.

Warrington.—Rebuilding Stocks Hotel, Padgate, for Greenall Whitley & Co., St. Helens; W. J. Johnson, architect, 6, Egypt Street.

West Drayton.—Mortuary; U.D.C. surveyor.

Extensions to premises; Power Plant Co.

West Hartlepool.—Shop, Seaton Lane Estate, for Hartlepools Co-operative Society, Stockton Street, West Hartlepool.

Premises on the Seaton Lane Estate; J. W. Cameron & Co., Ltd., brewers, Lion Brewery, West Hartlepool.

Police buildings (£4,148); W. Pearson & Son.

Wood Green. — Factory extension, Station Road; Field & Palmer, Ltd.

Worcestershire.—County senior school, Malvern, for E.C.; county architect, Foregate Street, Worcester.

Workington.—Works extensions, Marsh Street; United Steel Co., Ltd., Moss Bay.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Thursday, March 7th. Institution, London, W.C.2. 6 p.m. "Oil-less Metal-clad Switchgear for Medium-voltage AC Circuits up to 660-V, Three-phase," by H. E. Cox and L. Drucquer.

Meter and Instrument Section.—Friday, March 1st. Institution, London, W.C.2. 6 p.m. "A Method of Measuring and Recording the Frequency Error of AC Power Supplies." By F. O. Morrell. A demonstration of the principles of the "Quartz Crystal Clock." By L. Essen.

Wireless Section.—Wednesday, March 6th. Institution, London, W.C.2. 6 p.m. "Wire Broadcasting Investigations at Audio and Carrier Frequencies." By Dr. T. Walmsley.

Mersey and North Wales (Liverpool) Centre.—Monday, March 4th. Liverpool Royal Institution. 6.15 p.m. Paper by H. E. Cox and L. Drucquer, as above.

Tees-Side Sub-Centre. — Wednesday, March 6th. Cleveland Scientific and Technical Institute, Middlesbrough. 6.45 p.m. "Electronic Musical Instruments and the Development of the Pipeless Organ." By G. T. Winch and A. M. Midgley.

North Midland Centre. — Saturday, March 9th. Hotel Metropole, Leeds. 2 p.m. Discussion on "Fire-fighting Equipment for Electrical Installations (based on the E.R.A. Report)." To be opened by J. Hacking and R. A. McMahon.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, March 5th. Caxton Hall, Westminster. 6 p.m. "Commissioning of Relays and Protective Gear." By A. J. Hazelfoot.

Institution of Engineers-in-Charge.—Tuesday, March 5th. Magnet House, Kingsway, W.C.2. 6.30 p.m. Joint meeting with the Association of Supervising Electrical Engineers. "The Principles and Practice of Discharge Lighting." By R. O. Ackerley.

Royal Institution.—Wednesday, March 6th. 21, Albemarle Street, W.1. 5.15 p.m. "X-ray Optics." By Prof. W. L. Bragg.